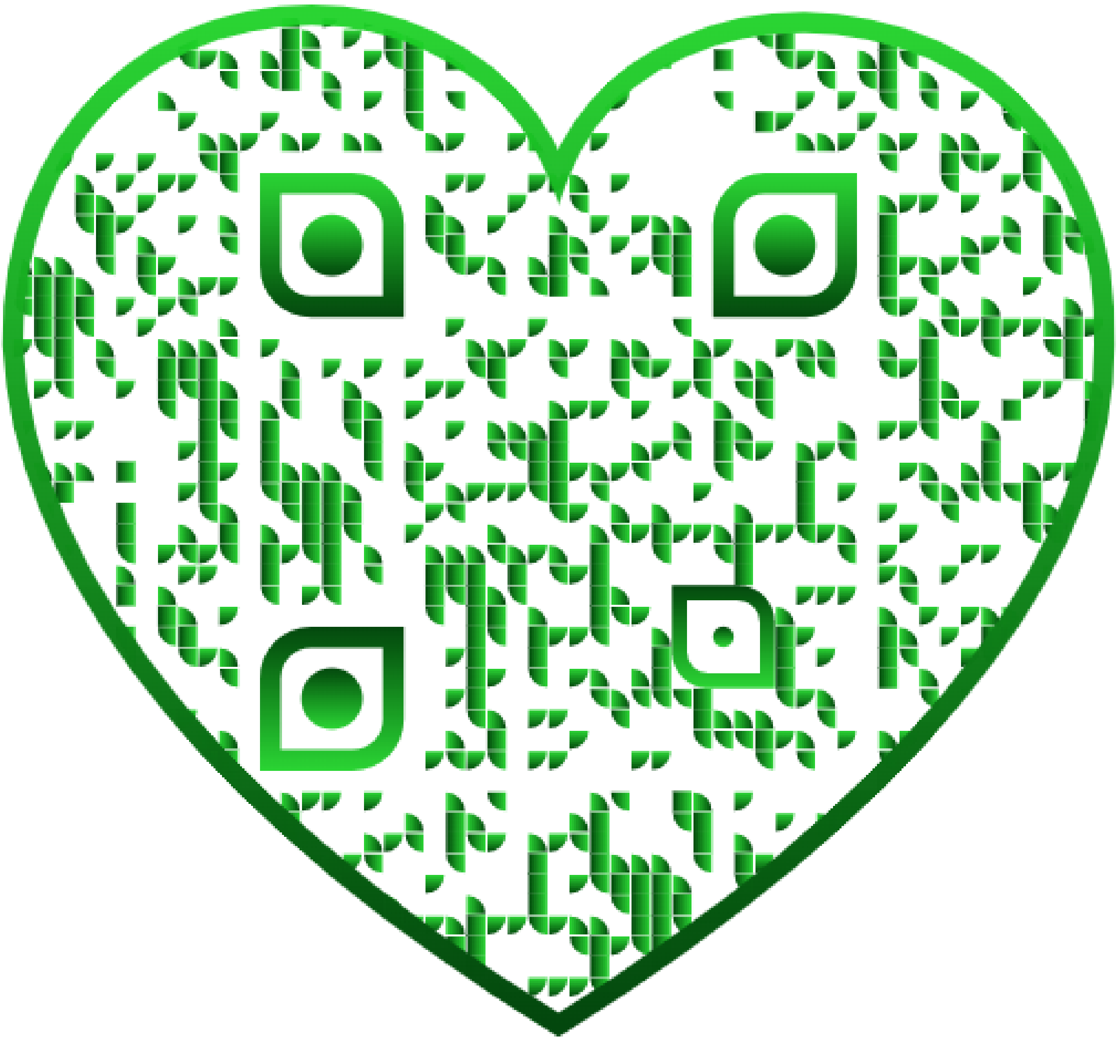
June 2025 The International Publication of the American Society of Cinematographers

American Cinematographer

Sinners

Autumn Durald Arkapaw, ASC
Films Southern Gothic in 65mm



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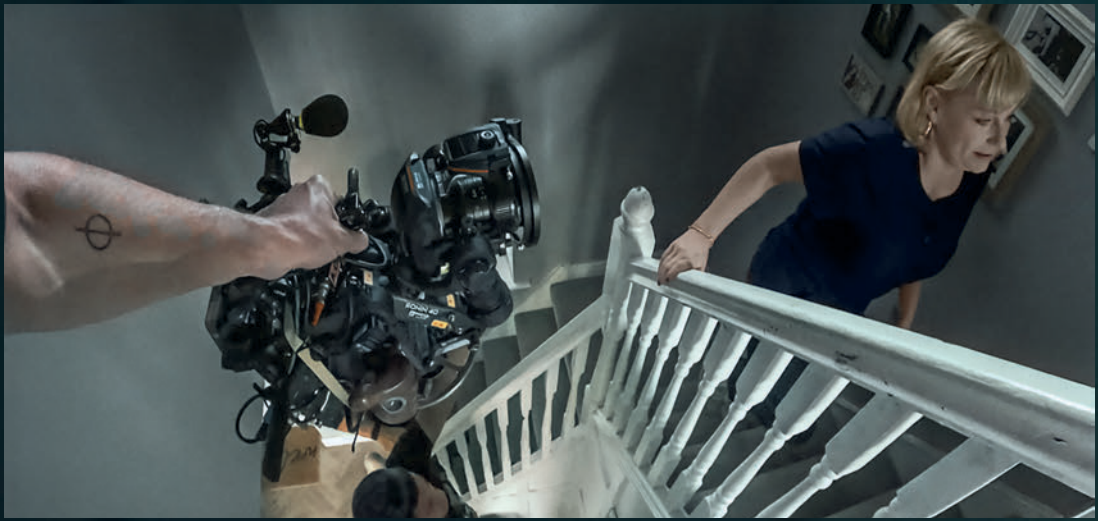

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American Cinematographer

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Michael B. Jordan and Miles Caton star as Smoke and Sammie in *Sinners*, shot by Autumn Durald Arkapaw, ASC. (Image courtesy of Warner Bros. Pictures.)

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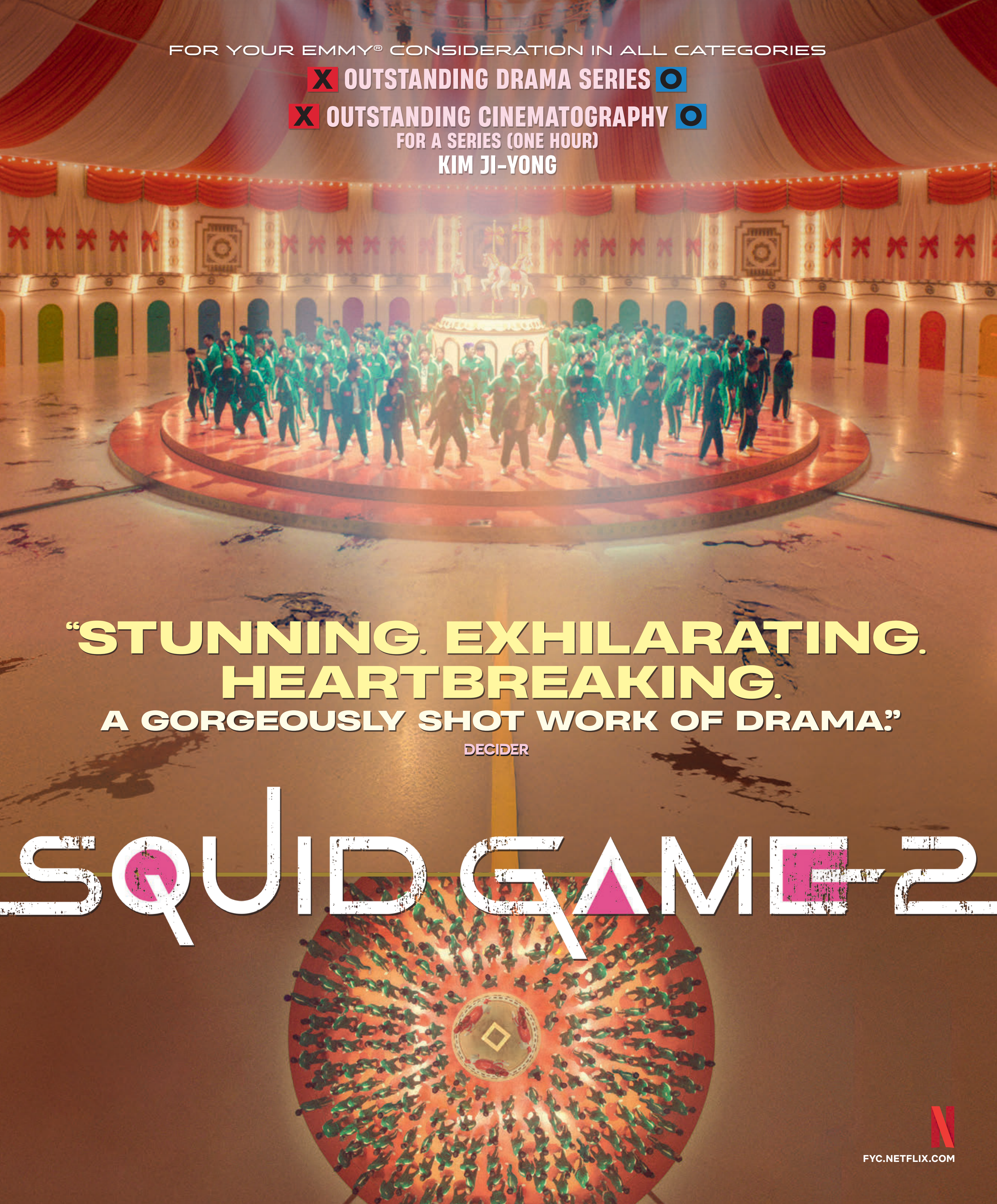

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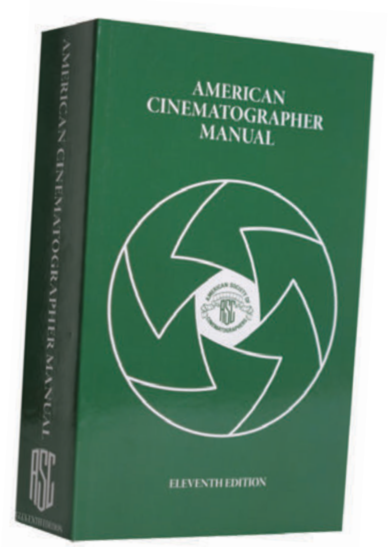
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CREATIVE DIRECTION and DESIGN
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ADVERTISING
ADVERTISING SALES DIRECTOR Sanja Pearce
323-952-2114 / Fax 323-952-2140 sanja@ascmag.com
ADVERTISING SALES DIRECTOR Michael Ibañez
626-217-0685 michael@ascmag.com

SUBSCRIPTIONS, BOOKS and PRODUCTS
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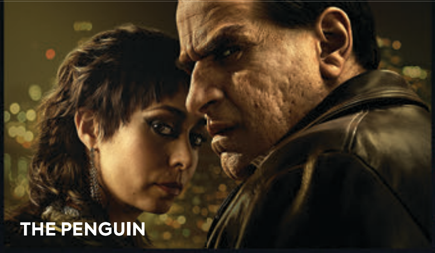
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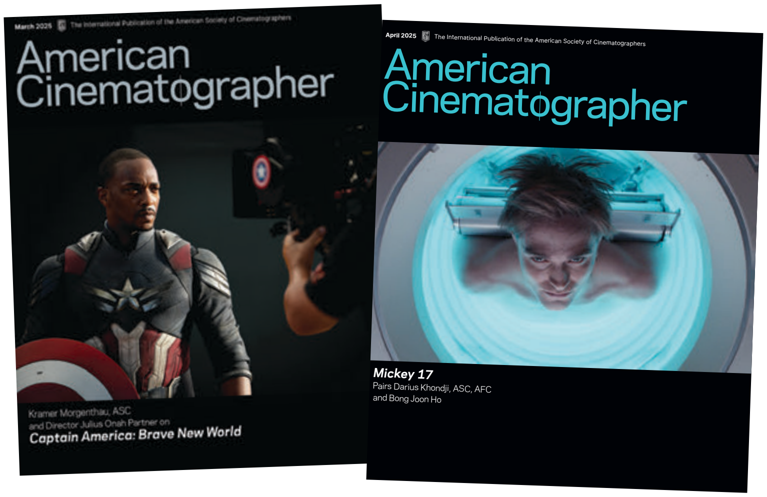
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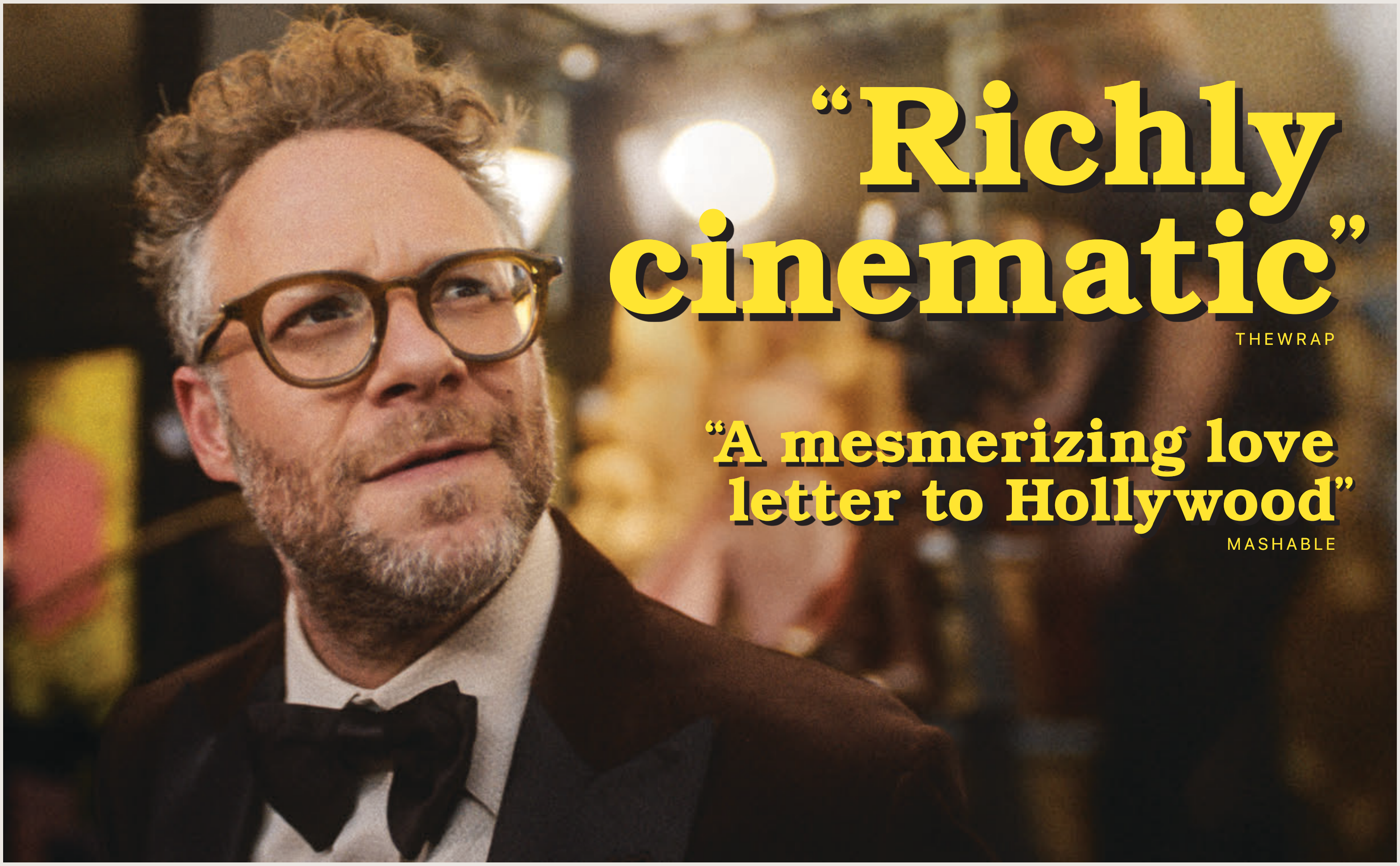
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President's Desk

PORTRAIT BY JOHN SIMMONS, ASC.

As of this writing, my time as ASC president has nearly run its natural course, and I will term-out at the end of May, so this will be my last column. A new ASC president takes office on June 1, 2025.

Two years ago, I began my first column by discussing this magazine and the people who make it. The fond feelings I expressed extended to all ASC staffers, who work diligently to help our members realize the full potential of their Society. It's no mystery that the most successful ASC programs are the ones that benefit from the robust participation of members and staff. It's a winning collaboration that any ASC president can enjoy and help to inspire.

Like any institution, the ASC is a happier place when it is stable, free of all burden and allowed to flourish. In a perfect world, our work would have no political agenda, labor strife or posturing. As a Society, our mission is to share ideas that advance the art and science of cinematography and promote artistic excellence. That mission includes education, through which we uphold the highest standards of our art form while teaching future generations. Of course, this includes equity of opportunity. Nobody is *entitled* to be a cinematographer, but anyone should have the right to achieve that position through hard work and by developing their unique artistic voice.

When my tenure began, I felt that the ASC had to make change happen. A number of underrepresented groups were hoping to join our Society and become part of the ASC's new direction. Women's membership has grown by more than 30 percent over the past two years, and women now comprise one-third of our newly elected, 15-member Board of Governors, which also assumes its duties in June. Additionally, 50 percent of our board members come from underrepresented groups. In my opinion, the ASC is taking a big swing toward the good. We've re-embraced the concept of the Society as a positive industry force, communicating its message in a very active way: *"Let's not tell them — let's show them."*

I hope I've encouraged that type of ideal to keep moving forward — and made it a priority for the Society to reflect positivity and optimism toward anyone or any issue that comes our way. I'm confident the ASC will continue to evolve in promising ways, and I can't wait to be part of the process.

As I pass the presidency along to my successor, I'd like to thank our membership and Board of Governors for patiently enduring my lack of proper conference protocols and my reluctance to use the gavel at board meetings. I'd also like to thank the ASC officers who have helped me tremendously over these past two years: Vice Presidents Charlie Lieberman, Patti Lee, Johnny Simmons and Cynthia Pusheck, who provided invaluable assistance in the execution of my duties; Treasurer Chuck Minsky, for his conviction in helping us to update the ASC's business and financial structure; and Secretary Dejan Georgevich, who served as a meaningful point of connection between Hollywood and our fantastic East Coast membership. I was also blessed with the sage counsel of past presidents Michael Goi and Richard Crudo.

The tireless assistance provided by these individuals and our two dozen ASC staffers, combined with the contributions of our broader membership, makes me consider the importance of consistent, small successes to the creation of Big Wins. Hopefully, we have teed things up nicely for the ASC of the near future.

It has truly been an honor to serve, and I deeply appreciate the enthusiasm everyone has shown over the past two years.

Best regards,

SHELLY JOHNSON

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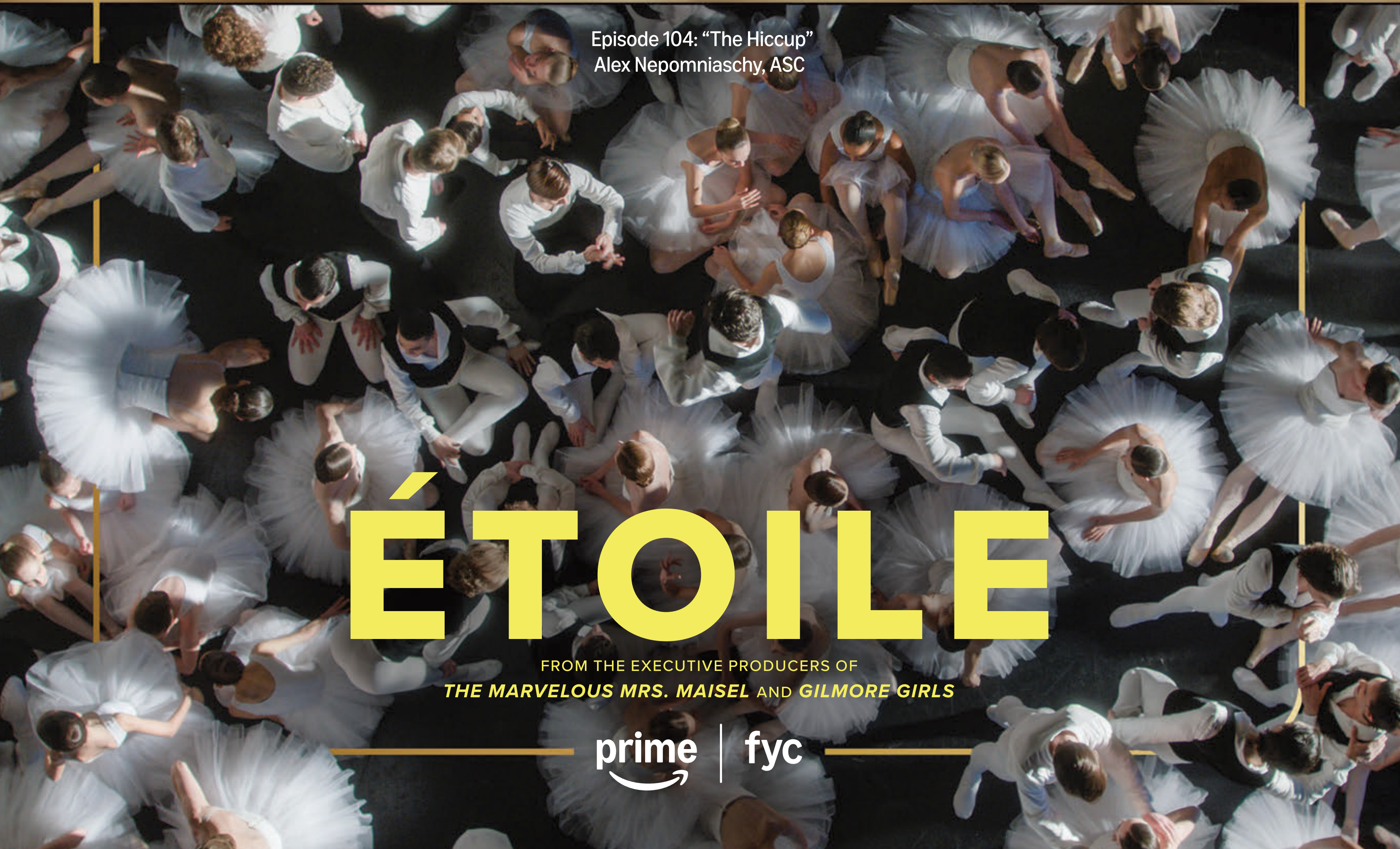

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By Jay Holben

Color and Storytelling

For *Blade Runner 2049* (*AC* Dec. '17), Roger Deakins, ASC, BSC and director Denis Villeneuve used a saturated orange to denote the radioactive wasteland of Las Vegas.

IMAGE FROM *BLADE RUNNER 2049* (WARNER BROS. PICTURES).

Color can help filmmakers tell a story as effectively as dialogue or camera movement. It can add subtext to the image — conveying time, place, mood, culture, character and emotion. It can signify something specific; it can be a subtle harbinger of events to come.

As children, most of us learn to identify colors by association: red as an apple, green as grass, yellow as a banana, blue as the sky, etc. As we mature, these associations take on deeper meaning, and we respond to color through an emotional connection. The wise cinematographer understands these psychological impressions and how to exploit them.

The Power of Association

There's a reason why stop signs and stop lights are red: This color symbolizes danger. Red is blood, the inside of a predator's mouth, and it registers in our minds quickly. It is also one of the first colors infants can recognize and one of the last we lose sensitivity to as we age.

Blue generally evokes feelings of trust and calm; the sky is blue and water looks blue, so we connect it with life and nature. Blue is often used in graphics by banks and tech companies to represent stability and intelligence.

Yellow, though associated with sunlight, is also recognized as the hue of dangerous insects like wasps and has come to symbolize caution, evidenced by its use as the color of warning signs — which need to be immediately recognized by anyone who sees them — throughout the world.

Green signifies nature and growth and is often used in hospitals for a calming effect, but can also represent envy or the uncanny.

The general psychology of color divides the spectrum into two categories: warm and cool. (Ironically, this is the opposite of their physical temperatures, as "cool" colors are significantly higher Kelvin and "warm" significantly lower.)

Warm colors — red, yellow, orange — typically evoke positive feelings of warmth, passion and happiness, but can also indicate aggression, violence, anger and hatred.

Cool colors — blue, green, purple — can convey serenity and calmness, but also apathy or sadness.

Black can symbolize evil, death or threat — or power and style.

White can symbolize youth, purity or innocence, but also suggest sterility and coldness.

Here's the kicker, though: The psychological interpretation of color can change across cultures. In China, for example, red typically symbolizes luck, celebration and prosperity. In India, red is tied to marriage and fertility. In many Eastern cultures, white is associated with mourning and death. Filmmakers can't necessarily reconcile the varying perceptions of a global audience, but it's another element to consider in the visual language of your film.

How do filmmakers use color? *Everywhere*, although it's most prominent in production design, wardrobe, makeup and props — and, of course, cinematography.

Altering Perception

The cinematographer must have an intimate understanding of the combination of colors, as this can affect how a viewer perceives these colors. A background and foreground color can modify each other. Colors appear lighter against a black background and darker against a white one. In a small space, lighter colors give the illusion of more space and, conversely, applying dark colors creates the illusion that a space is smaller than it is.

Our perception of color also affects how we interpret depth and distance in a frame. Warmer colors tend to feel closer to the viewer, whereas cooler colors

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Green | From top: *The Matrix Reloaded* (Warner Bros. Pictures), *Black Swan* (Fox Searchlight Pictures), *Vertigo* (Paramount Pictures), *The Ring* (DreamWorks Distribution).

tend to recede. This isn't just psychology, it's physics. In nature, the farther something is from us, the more atmospheric haze stands between it and our eyes. That haze filters out warmer wavelengths of light first, which is why distant mountains look blue or gray. This can be used to suggest more depth in a shot than you might actually have — especially with forced perspective — but it can also confuse an audience if you're not careful. For example, placing a cool-colored object more in the foreground against a warmer backdrop can perplex the eye and brain.

Additive and subtractive color mixing are key components as well (*AC* Jan. '20). If you put blue moonlight into a set with brown walls, you should know that those walls are going to appear black in the image. Color needs to be an important discussion among department heads to make sure everyone is on the same page with the director's vision.

Bold Strokes

Sometimes color becomes a "character" in its own right, and filmmakers bathe scenes in a particular hue to represent the narrative moment and emotional context. Here are some examples:

Green

The green tint that Bill Pope and the Wachowskis use to help define the world of the eponymous computer simulation in *The Matrix* (*AC* April '99) — a technique they intensified in the series' second and third installments — not only suggests the digital world, but also creates an eerie, unnatural filter that tells your brain something is off. It's a subtle nod to old CRT monitors, sure, but also a visual clue that you're watching a constructed reality.

In Darren Aronofsky's *Black Swan* (*AC* Dec. '10), Matthew Libatique, ASC, LPS brings out a deeply saturated green for a nightclub scene depicting Nina (Natalie Portman) intoxicated, impulsive and letting loose as she nears her transformation into the Swan Queen. The color reflects a duality, with Nina questioning what is real and what she may be imagining.

Alfred Hitchcock's *Vertigo* (*AC* Nov. '96), shot by Robert Burks, ASC, uses green to denote obsession. The color is significant in costume and production design, and is especially notable in the neon glow of the sign outside the hotel-room window when Judy (Kim Novak) resurrects Madeleine, dreamlike and ghostly, for Scotty (James Stewart).

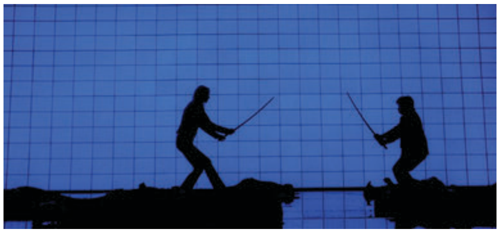
For *The Ring* (*AC* Nov. '02), Bojan Bazelli, ASC went deep into green with two custom filters for the camera that give Gore Verbinski's adaptation of the Japanese horror classic a sickly hue.

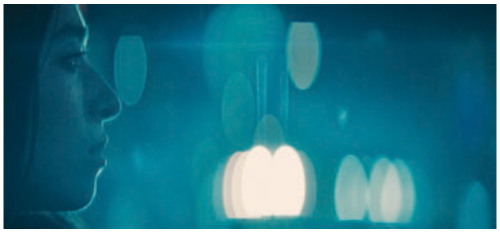
Blue

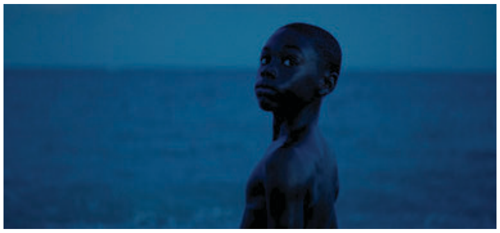
For the turning point in a sword battle in *Kill Bill Vol. 1* (*AC* Oct. '03), Robert Richardson, ASC and director Quentin Tarantino stage the action in silhouette against a glowing blue wall. This takes the hyper-violent battle into a stylized look that presents the fighting technique of the Bride (Uma Thurman) as precise and controlled.

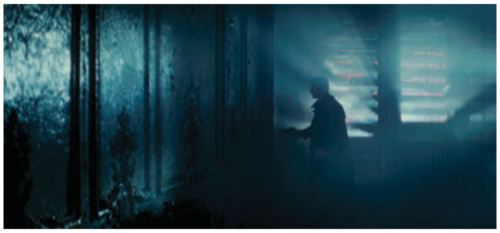
In *Anora* (*AC* Dec. '24),

> **Sometimes color becomes a "character" in its own right, and filmmakers bathe scenes in a particular hue to represent the narrative moment and emotional context.**









Blue | From top: *Kill Bill Vol. 1* (Miramax Films), *Anora* (Neon), *Moonlight* (A24), *Blade Runner* (Warner Bros. Pictures).

cinematographer Drew Daniels and director Sean Baker use a largely naturalistic palette, but blue is introduced as a powerful emotional anchor at key moments to evoke loneliness, vulnerability and emotional detachment. The color is used most prominently to emphasize the disconnection of Anora (Mikey Madison) from the opulence and chaos around her.

In Barry Jenkins' *Moonlight* (*AC* March '17), James Laxton, ASC uses deep blues as an emotional backbone to mirror the loneliness and inner struggle of Chiron (Alex R. Hibbert, Ashton Sanders, Trevante Rhodes). The color palette is rich but restrained — blue water, blue neon, blue hour, all signaling identity, masculinity and emotional distance.

Jordan Cronenweth, ASC and director Ridley Scott soak *Blade Runner* (*AC* July '82) in atmospheric night that has a blue/cyan feel, giving a wash to the modern noir look.

Red

For *Goodfellas*, Michael Ballhaus, ASC, BVK and director Martin Scorsese stage the unearthing of the dead and long-buried Billy Batts (Frank Vincent) by Jimmy (Robert De Niro), Tommy (Joe Pesci) and Henry (Ray Liotta) against the deep red glow of car lamps, highlighting the brutality of his death and the characters who brought it about.

Luciano Tovoli, ASC, AIC and Dario Argento famously use hypersaturated red light in the horror classic *Suspiria* (*AC* Feb. '10) to evoke fear, anger, blood and magic.

In *The Neon Demon* (*AC* July '16), Natasha Braier, ASC, ADF and director Nicolas Winding Refn use red light as a symbol of sexuality, envy and violence. It floods the screen, often unmotivated, heightening the psychological effect. Red strips away from Jesse (Elle Fanning) the glamour of beauty. (See Shot Craft, *AC* Oct. '24, for more on unmotivated lighting.)

In *Ex Machina* (*AC* May '15), Rob Hardy, ASC, BSC and director Alex Garland use diegetic red light to indicate a loss of electrical power, which brings about total freedom for Caleb (Domhnall Gleeson) to connect with artificial human Ava (Alicia Vikander). Red, here, indicates raw, primal urges, but also appears when Ava gains power over Caleb.

Muted Palettes

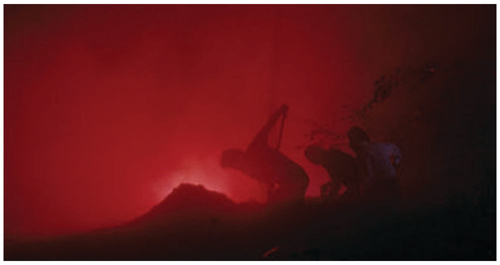
A restrained use of color can be just as suggestive as a bold one.

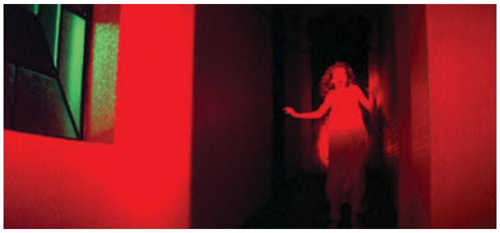
Alfonso Cuarón's *Children of Men* (*AC* Dec. '06), shot by Emmanuel Lubezki, ASC, AMC, strips color to the bone. Grays, browns and desaturated greens tell us this is a world drained of hope, and the palette becomes a grim visual statement about fertility, life and the future.

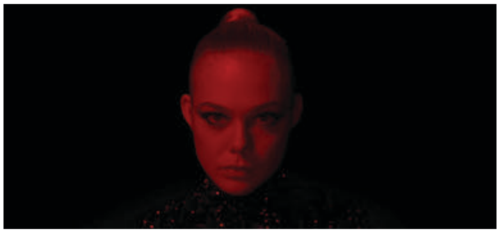
In a similar vein, Javier Aguirresarobe, ASC, AEC and director John Hillcoat keep the world of *The Road* cool and washed out, suggesting an emotional numbness.

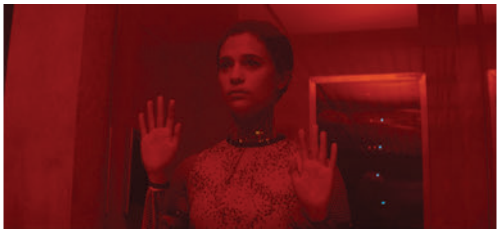
Feeling a World

Great cinematography doesn't just show you a world, it makes you *feel* it. All of these examples represent deliberate choices made by the filmmakers to create or accentuate emotional cues with color, guiding you through the story without saying a word.

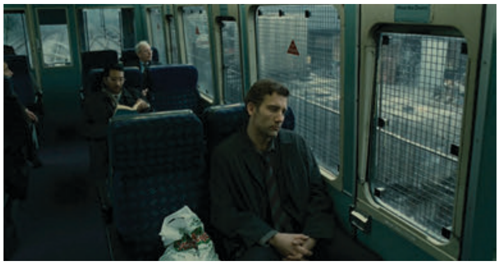


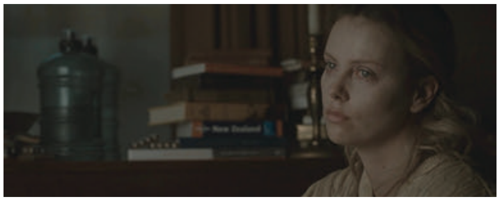




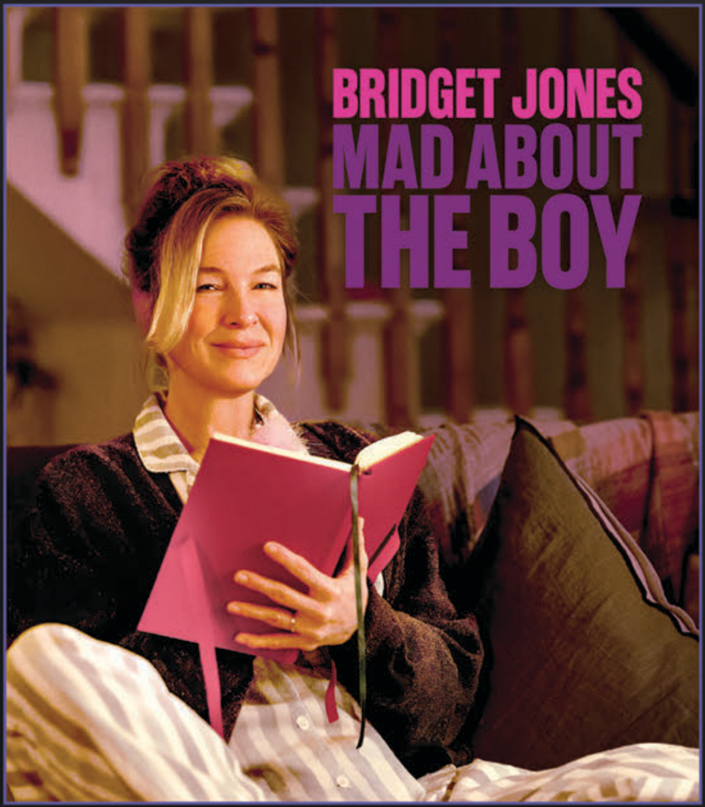


Red | From top: *Goodfellas* (Warner Bros. Pictures), *Suspiria* (Amazon Studios), *The Neon Demon* (Broad Green Pictures), *Ex Machina* (A24).





Muted Palette | From top: *Children of Men* (Universal Pictures), *The Road* (TWC).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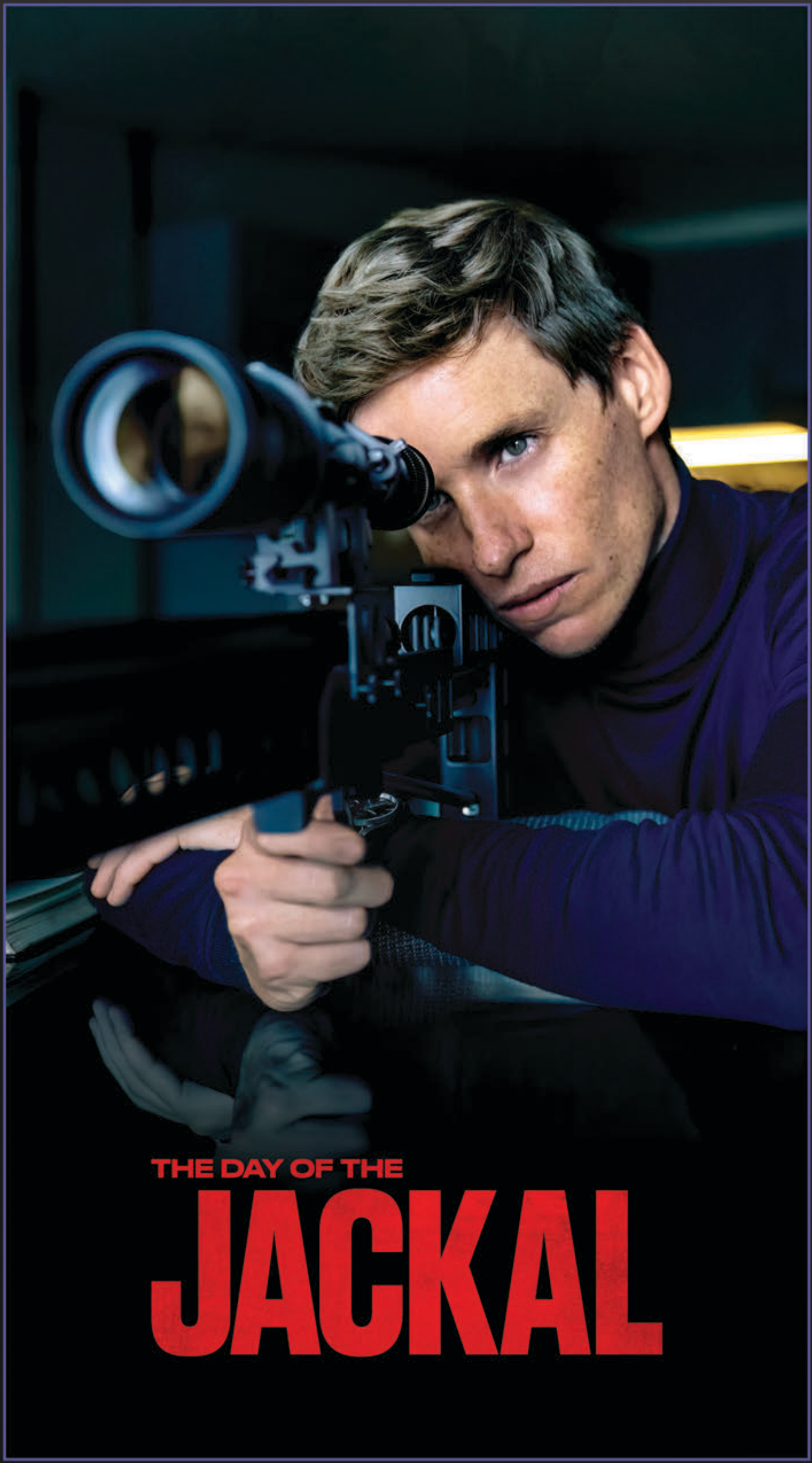
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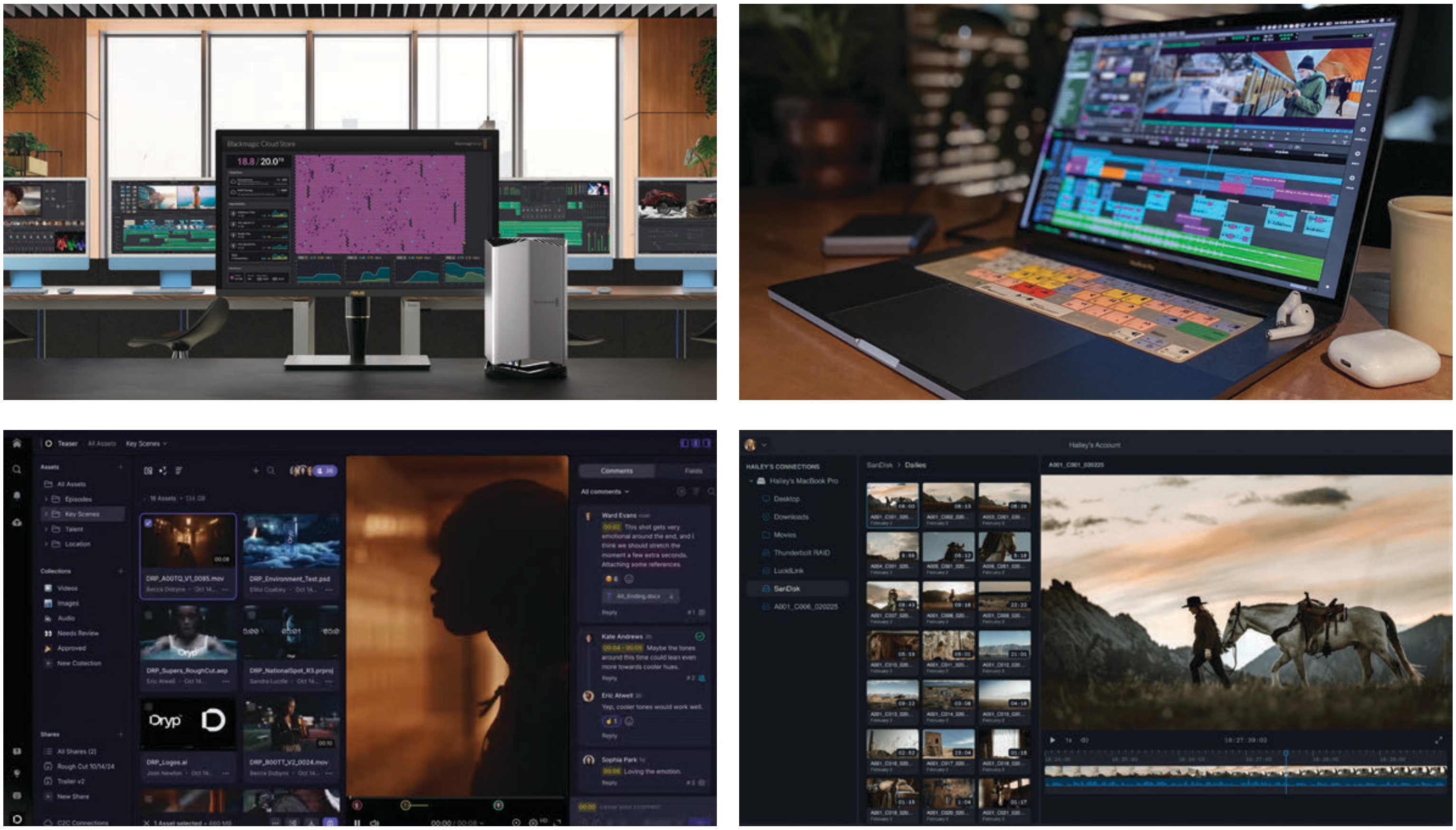
Tools of the Trade

By Iain Marcks

Cloud-Based Production



Clockwise from top left: Blackmagic Design's Cloud Store, Avid's MediaCentral, Strada and Frame.io are systems designed to function with cloud-based assets.

When ASC associate member Joachim Zell invited more than a dozen filmmakers and technologists to help stage a live demonstration of an end-to-end, cloud-based motion-picture workflow at the HPA Tech Retreat in February 2020, the concept was untested. Productions had been using such online collaborative platforms as Pix Systems, Frame.io and Moxion for segments of their workflows — chiefly viewing dailies and providing notes on rough cuts — but prohibitive cost and bandwidth requirements had prevented anyone from attempting a cloud-based production from acquisition through post.

But with virtual production on the horizon, it was time to take the next step.

"We thought: The cloud is interesting and virtual production is interesting — let's bring them together," recalls Zell, who was EFilm's vice president of technology at the time.

"2030 Vision"

One year earlier, MovieLabs, a nonprofit R&D company founded by the major Hollywood studios, had published a white paper detailing a 10-year vision for the future of media production, post and creative technologies, with a focus on the cloud's emergent role in the film industry. Dubbed the "2030 Vision," the document defined "the cloud" as "any internet-accessible storage platform that can be used as a common space for collaboration and exchange of data," and the authors predicted "the workflow benefits of a 'single source of truth' will make the cloud an integral part of our industry in the future and remove the duplication of assets seen today."

The Lost Lederhosen

The HPA Tech Retreat demo was the final day of a four-day production for a short film called *The Lost Lederhosen*, which was captured before a live audience — by a crew that included ASC and DGA member Steven Shaw, who directed; Roy H. Wagner, ASC, who served as director of photography; Peter Moss, ASC, ACS, camera operator; and Stargate Studios' founder Sam Nicholson, ASC, visual-effects supervisor.

Footage was captured at 4K, 6K and 8K across five camera systems: Arri Alexa LF, Red Monstro, Panavision DXL2, Blackmagic Design Ursa Mini Pro and Sony Venice. All editorial assets were uploaded to Microsoft's Azure, Amazon Web Services S3 and Google Cloud Platform from LTE hotspots on the set. "Not every camera uploaded directly," notes Zell. "The Alexa had to go through a Codex station first."

IMAGES COURESY OF THE HOLLYWOOD PROFESSIONAL ASSOCIATION.

Top: Roy H. Wagner, ASC and a crewmember at work during the cloud-based production of the short film *The Lost Lederhosen*, which was spearheaded by ASC associate member Joachim Zell, at the 2020 Hollywood Professional Association Tech Retreat. Bottom: ASC members (from left) Peter Moss, Wagner and Steven Shaw served, respectively, as camera operator, cinematographer and director on the film.

The Supersession began with a 20-minute prep involving Zell, Shaw, Wagner, Moss, Nicholson and Ricardo Mejia of 616 Music Lab, and the day included three shooting blocks for live scenes — as well as a drone shoot conducted by Mark Bender Aerials, an introduction to virtual production and Unreal Engine, ACES implementation in the color workflow, on-set color correction with the ASC CDL, a proof of concept for Frame.io's platform for instant dailies and editing in the cloud, Colorfront OSD dailies processing, Transkoder deliverables for visual effects and the color grade, editing in Avid Media Composer, remote sound mixing at Skywalker Sound, and remote grading in FilmLight Baselight and Blackmagic Design DaVinci Resolve.

By dinnertime that day, attendees had screened the final film via Resolve and received a URL via Red Bee Media to watch it on their phones.

With the Supersession, Zell and the team demonstrated for a live audience not only the validity of cloud-based workflow, but the ease of connecting vastly separated geographic locations into a relatively seamless pipeline that allowed for near-real-time collaboration, even within the shooting and post environment of a hotel ballroom. "At the time, a lot of people [in the film industry] didn't even know that was possible," Zell recalls. "A month later, the pandemic hit, and suddenly everyone had to use the cloud — remote editing, working from home and compositing alone all became standard. So that test ended up benefiting everyone."

The Cloud Today

Now that in-person production has resumed, how are filmmakers using cloud-based technologies today? *AC* explores this question in the following pages, assisted by insights from Nicholson; Zell, now the head of HDR content workflow for Barco; ASC associate member and Strada co-founder Michael Cioni, who participated in *The Lost Lederhosen* in his former role as senior vice president of global innovation at Frame.io; producer Ron Ames (*The Lord of the Rings: The Rings of Power*); and Bob Caniglia, Blackmagic Design's director of sales operations, North America.

Stored Upon Creation

The "2030 Vision" document outlines a scenario where "all assets are created or ingested straight into the cloud and do not need to be moved … Every captured file, every computer-generated asset and all associated metadata will be stored immediately upon creation in the cloud. Acquisition devices could directly connect to the cloud … sending encrypted, uncompressed files and simultaneously a proxy straight to cloud storage."

As of 2022, Frame.io, Blackmagic Cloud and Autodesk Flow Capture have supported camera-to-cloud workflows, which look a lot like the one employed for *The Lost Lederhosen*, only faster.

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Moss operates as a scene is captured before a live audience.

Selectively Online

Current cloud workflows also include local components, because it's still too costly for the average production to remain entirely online. One gigabyte on a hard drive can cost up to 40 times less than in the cloud, and hybrid workflows with local storage — whether it's a studio server or hard drives — deliver the data faster. Thinking back to the HPA demo, Zell recalls the crowd of roughly 700 arriving: "Suddenly, 700 phones and 350 laptops were on the same Wi-Fi, and we were on it, too. We lost bandwidth. We weren't in a data center, we were in a convention hall. The system just couldn't handle it. It was a wake-up call that the infrastructure wasn't ready to go 100-percent cloud. It still isn't, no matter how good the theory is."

There seems to be a consensus that the cloud's greatest value is its collaborative potential. "If your editor can start working without being on set or even in the same time zone, that's a big win," Nicholson says. However, he continues, "whether you're in visual effects or editorial, production is a pipeline — from capture to delivery. How you shoot, store and move data matters. Is it proprietary? Is it secure? How heavy is it? That's where the cloud gets tricky."

Strada's Cioni notes that the cloud wasn't built for storing complex video files. "Most files — PDFs, spreadsheets, photos — are simple compared to video," he says. "All the data Chase Bank has ever produced in its 80-year history comes out to around 300 terabytes. A single production can hit that easily."

Furthermore, a web browser can't de-Bayer a raw file, and filmmakers don't own their storage space in the cloud. "You're just renting space to hold footage you may never need again," Cioni says. "And no one's shooting *less*."

"Know the Path"

A tenet of "2030 Vision" is that anything, from production assets to final content, can be shared via the cloud. At the moment, though, Zell prefers to deliver DCPs and DCDMs on physical drives via Deluxe, Eikon or Pixelogic. "For now, hard drives are the cheaper distribution option," he says.

Blackmagic Design's Caniglia notes that many cloud-based workflows use cloud storage as a conduit for large files, and this has reframed the workflow. "Don't store everything in the cloud, just pass it through," he says. "If you've got a 12-terabyte project, you don't need [more than] 12 terabytes of cloud storage, [you need] just enough to transfer it. Local systems still handle the heavy lifting. Proxies reduce load, and bandwidth is improving."

When determining where cloud systems fit into a project workflow, it may be helpful to consider Nicholson's philosophy on the varying needs of different departments. As high-end tasks such as color grading and VFX demand real-time playback and processing power, he recommends making five or six versions of every camera file, transcoded to multiple formats and uploaded based on user need. Colorists need full-resolution files. Editors need proxies. Directors want something they can watch on an iPad. The studio wants color-graded dailies. "Know the path and tailor your files accordingly," says Nicholson. "In a 4K, 8K world, data gets heavy fast."

Instant Feedback

An ideal production workflow is built around real-time iteration and feedback. "That's the real power of the cloud: collaboration," says Cioni. "Whether you're two people or 2,000, the core challenge is the same: working together." Collaboration *speed* often depends on the speed of the internet connection, which varies greatly from country to country. According to a study by the World Population Review, as of this year, North America's average download speed (162 Mbps) is faster than the United Kingdom's (111 Mbps) and Mexico's (44.7 Mbps), but trails Denmark's (211 Mbps) and South Korea's (173 Mbps). Networks are said to be in sync when both ends of a connection have the same bandwidth. As Nicholson elaborates, "We can upload something in 20 minutes, but if the other side takes seven hours to download, that breaks the pipeline." He adds that there's also the matter of latency, the time it takes for data to pass from one point on a network to another.

Mark Bender Aerials contributed original footage to the HPA film.

A Case in Point

On the first season of Amazon Studios' series *The Lord of the Rings: The Rings of Power* (*AC* Dec. '22), producer Ames was facing the requisite challenges: coordinating the army of artists and technicians — art, cinematography, visual effects, post, editorial, music and sound departments, and more — from New Zealand, where production was based, to England, to California, and making the production's digital assets easily and securely accessible to everyone.

Ames recalls, "Normally, you'd ship in a big server and set it up on location, but I said to Amazon, 'You're a cloud provider. Why not do this as a cloud-based production?' I asked for unlimited storage. They said yes, maybe without realizing the full scope."

Being in New Zealand was a big help, he notes. The country is "late to tech, but all-in on fiber-optic connections," he describes. "You can achieve enterprise-level speeds from your apartment." The production chose Autodesk Flow Capture (formerly Moxion) to provide its cloud-based-workflow tools, working closely with Moxion co-founder Hugh Calveley to expand the platform for dailies, review and data sharing. They also worked with Rebel Fleet, a local production-services provider, to design a camera-to-cloud pipeline using Qtake and Flow Capture Immediates.

From the start, all assets were uploaded to the cloud and organized using Autodesk Flow Production Tracking (formerly ShotGrid), a virtual production-management and review tool that provided quick access to script sides, production notes and reference material. Editorial was on set, cutting in real time. "The cloud shifted how our departments communicated," says Ames. "No one said, 'This is cloud-based.' It just became standard, and it brought a level of collaboration we rarely see today. For a smaller-scale project, maybe it's not essential, but for technically complex projects, it's a game changer."

Security was another major win, he adds. "We'd push sequences to Industrial Light & Magic in San Francisco, and they'd pull them down, do their work, upload them back, and editorial could keep going. And every version was tracked in the cloud — whether proxies or full-res, it was all there. And with the bandwidth we had, we pushed the system hard."

About nine months before the final color grade was scheduled to start, Ames approached Company 3 and Blackmagic Design about cloud integration for DaVinci Resolve. Both agreed, delivering a workflow that allowed colorist Skip Kimball to work on a Resolve system at home in Idaho while the directors and cinematographers watched the final grade in real time on calibrated monitors in New Zealand.

"2030 Vision" states that "archives should be deep, cloud-based libraries with access policies matched to speed, availability and

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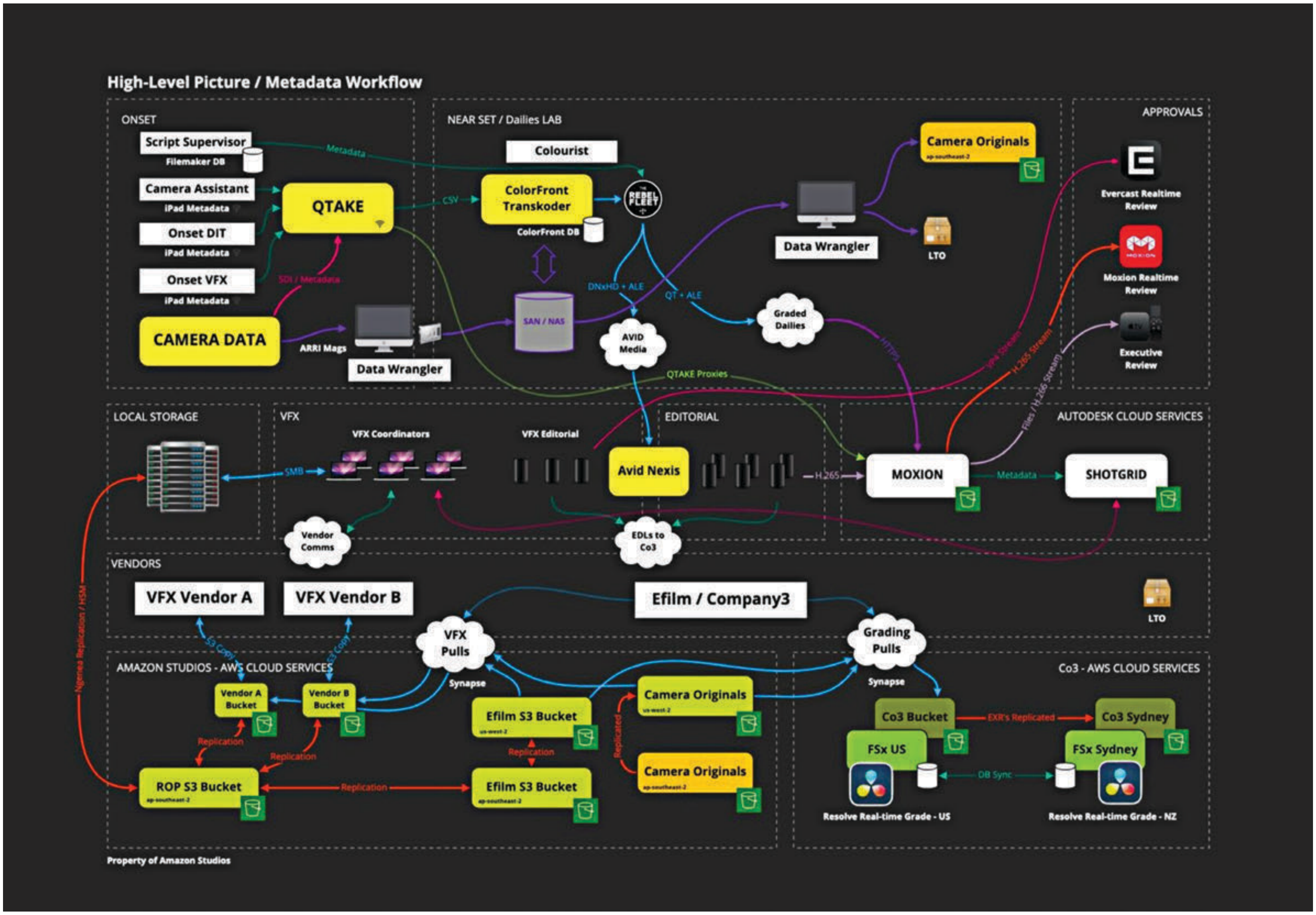
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Above: A diagram of the metadata workflow for the cloud-based production of *The Lord of the Rings: The Rings of Power*. Opposite: Imagery from the ambitious Prime Video series.

IMAGE PROPERTY OF AMAZON STUDIOS.

cost," and that "preservation must include future access and editability of digital assets." Ames took advantage of Amazon's vast resources to archive all *Rings of Power* assets in the cloud. He prefers the benefits that cloud storage offers — vs. locally stored LTO and spinning discs — wherein color information and key elements are kept in a "stripped-down archive" that doesn't require obsolete software, formats or operating systems to access.

Ames acknowledges that he hadn't fully thought out how he would use Amazon's cloud-storage resources when he first requested them, and he ended up archiving multiple iterations of frames, shots, color files, visual-effects assets and design documents from the first season. "In a more efficient setup, you could pare down to just what's essential and offload the rest to lower-cost tiers of cloud storage," he says.

When principal photography for the second season of *The Rings of Power* was moved to the United Kingdom, Ames passed all Season 1 digital assets to the new creative team with the press of a button. "It was fully organized and instantly accessible — they were up and running immediately with full access to petabytes of creative work." The producer is sure to acknowledge that much of what he was able to accomplish in the cloud was made possible by his association with Amazon: "This was a spectacularly rarefied opportunity."

On the Volume

Virtual productions, particularly those that capture in-camera visual effects on an LED-wall volume, are more dependent on cloud support than physical productions because they're often pulling down digital assets to use on set. Zell provides an example: "Say you're on [the volume] looking at a background plate, and the director says, 'Wouldn't it be nice to have a palm tree there?' With virtual production, you can just grab it — palm tree, tank, chicken, whatever — from massive online asset libraries. Or there could be a second unit on location sending background plates directly to the stage via the cloud."

The latter scenario is familiar to Nicholson, who often moves

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20,000-pixel-wide images — sometimes a terabyte per frame — to play back on 150' LED walls. On a recent project in Atlanta, he used 16 Sony Alpha 1s to capture a large-scale Travis Scott concert in 8K before pushing it through the cloud to artists in Canada, L.A. and Malta, with footage destined for playback on a volume.

"In virtual production, you're only as good as your volume content," Nicholson says. "The cloud lets us deliver multiple resolutions for different users; some pull assets on phones, others over high-speed fiber. If I can get you the asset quickly and you can tweak it locally or via the cloud, that's where it shines."

> **"The cloud shifted how our departments communicated. No one said, 'This is cloud-based.' It just became standard [on the production], and it brought a level of collaboration we rarely see today."**

At Stargate Studios, he uses a private cloud for secure, reliable access. In the field, his crews rely on high-speed/high-capacity Iodyne SSDs and CF cards. For studio work, they teamed with SanDisk and Western Digital to build out an infrastructure of a few hundred machines running in parallel, offering enterprise-level HDD storage with LTO backups for deep archive. "It's robust, and it keeps our data safe across the entire pipeline," Nicholson says.

Cloud-Based Forever

What if a production's digital assets don't need to leave the cloud at all? "2030 Vision" posits "a high-bandwidth, low-latency, cloud-enabled production model where files remain in place and software tools are brought to the content rather than moving the content to the tools." This solution is driven by "fast cloud storage, robust processing and virtualized workstations where artists need only a screen, an input device and sufficient bandwidth to stream a remote desktop. All compute tasks and file revisions happen in the cloud."

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IMAGE BY JEREMY BOROS.

"The cloud lets us deliver multiple resolutions for different users; some pull assets on phones, others over high-speed fiber," says Sam Nicholson, ASC, pictured here shooting a virtual-production test at Stargate Studios.

Blackmagic Design, Avid and others already offer this option, running off machine platforms such as Amazon's Elastic Compute Cloud, which allows users to install and remotely operate resource-intensive software on powerful machines.

Cioni explains how scaling the availability of processing power according to user needs is essential to the efficient operation of the cloud-based Strada system, especially when it comes to rendering. When Strada runs AI analysis on footage — facial recognition, location detection, emotions — it's performing compute-heavy work like a visual-effects render. The image is analyzed and parsed, and metadata gets written back into the file. "To speed that up, we built a cloud-based render farm that scales automatically as users submit files," Cioni says. "We rent more processors during peak times and scale back during lulls."

A Need for Standards

Ames has noted an industry-wide lack of interest in codifying rules for adopting cloud technology, and he finds that frustrating. "We could build systems and standards that let artists focus on the work and not reinvent workflows for every project." Conceding that tech evolves fast, he acknowledges the industry might have trouble keeping up no matter how hard people try, but "I do think something will eventually emerge."

Halfway to 2030

Ames — who served as visual effects producer on such features as *Star Trek Beyond* and *Avengers: Age of Ultron* — points to the use of real-time VFX and nonlinear data pipelines as two significant developments that would not have been possible without the ability to store and access massive amounts of information online. The idea that motion-picture production is a segmented, linear process is nonsensical, he says. "With movies like *Avatar*, camera capture, art department, editorial and VFX — it all happens at once in a continuous, integrated flow."

Nicholson is confident that cloud-based rendering, storage and collaboration are here to stay. "It's a powerful tool if you know how to use it," he says. Caniglia emphasizes that "simplicity and accessibility" are key to the success of any software platform; any system too complicated or expensive will limit who benefits.

> "If your editor can start working without being on set or even in the same time zone, that's a big win."

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Sinners: Big, Bold Blues and Blood

Autumn Durald Arkapaw, ASC and writer-director Ryan Coogler blend genres and formats for a fresh Southern-Gothic vision.

By Mark Dillon

Demons, gangsters and the blues are unlikely but compelling bedfellows in Ryan Coogler's *Sinners*, and he and director of photography Autumn Durald Arkapaw, ASC made an unconventional choice to render the tale: combining 5-perf 65mm Ultra Panavision and 15-perf 65mm Imax. "Ryan wants to push the boundaries when figuring out how to best tell a story," says Durald, "and this combination asks the viewer to really use their eyes and scan the image, going from this very wide landscape to the taller Imax frame. You wouldn't think these formats would work together, but they do. It immerses you in the characters' mindsets." Their decided approach also made history: Not only was this the first time these two formats had ever been combined on a feature, it was the first time a woman cinematographer had shot a feature in Imax 65mm — or on any 65mm film format.

UNIT STILLS BY ELI ADÉ, SMPSP. ALL IMAGES COURTESY OF WARNER BROS. PICTURES.

Set in 1932, *Sinners* tells the story of twins Smoke and Stack (both played by Michael B. Jordan), who return to their hometown of Clarksdale, Mississippi, to disentangle from the Chicago Mob. They purchase an old lumber mill, intending to create a juke joint to showcase the talents of their cousin Sammie (Miles Caton), but soon discover that racists and supernatural creatures stand in their way. The film's narrative transpires over 24 hours.

Durald, who first teamed with Coogler on *Black Panther: Wakanda Forever* (*AC* Dec. '22), recalls that when she read his original script for *Sinners*, "I couldn't put it down. It was one of the most exciting reads I've had. It was straight from his brain and had so much weight to it. I sent him a long email with my thoughts and said, 'Big imagination visuals here.' We email a lot back and forth, which is nice because we can always refer back to it."

They soon got to talking, and she homed in on what he wanted to communicate to the audience: "mood and tone, and what the heart and soul of the film is," she says, adding, "Those initial talks are what inspire me the most."

Creative Inspirations

Coogler recommended Durald get the book *Photographs* by Eudora Welty, a Mississippi writer who took pictures of local residents during the Depression. "She captured moments in time," Durald observes. "There is so much emotion in those one-off photos that tell a story; you see in people's faces what they went through."

They also discussed films, including *There Will Be Blood* (shot by Robert Elswit, ASC; *AC* Jan. '08), for its depiction of early 20th-century California; John Carpenter's *The Thing* (Dean Cundey, ASC), for characters terrorized by an alien force in a contained environment; and *The Last Emperor* (Vittorio Storaro, ASC, AIC), notably for "the beautiful train sequence that opens it," the cinematographer says. "That was one reference [for our train sequence], especially because we were shooting in this historic [Ultra Panavision 70] format. It was important to make that scene feel nostalgic."

When Warner Bros. approached Coogler about shooting at least some of *Sinners* in a larger format (see sidebar, page 30), specifically Imax, he and Durald became interested in originating on film to achieve the full 1.43:1 Imax frame. They had shot portions of the digitally originated *Wakanda Forever* in 1.90:1 for digital Imax exhibition. Durald notes, "When I think of Imax, I think of Christopher Nolan and *The Dark Knight* [Wally Pfister, ASC; *AC* July '08]. That's the first Imax picture I saw in a theater on a film print. It blew me away."

Coogler was also interested in exploring other 65mm formats. "He was thinking about what would most beautifully tell the story with our flat landscapes, where you could see someone coming from a mile away, or vampires who were hidden and suddenly appear," Durald says. She asked Andrew Oran at FotoKem to arrange a screening. He put together a menu of 70mm film clips from *The Hateful Eight* (Robert Richardson, ASC; *AC* Dec. '15), *2001: A Space Odyssey* (Geoffrey Unsworth, BSC; *AC* June '68), *Licorice Pizza* (Paul Thomas Anderson and Michael Bauman) and *Tenet* (Hoyte van Hoytema, ASC, FSF, NSC). "Ryan stood up, walked over to the screen and said, 'This is what I've been missing!' recalls Durald. "When he gives me a directive like that, I hit the ground running."

After shooting tests in the flatlands of Lancaster, California, the filmmakers decided to shoot most of the picture in Ultra Panavision 70, which was used on a handful of epics in the '50s and '60s and revived for *The Hateful Eight*. Durald chose Panavision System 65 Studio and System 65 High Speed cameras with Ultra Panatar lenses for her main package. Of her long-standing preference for anamorphic, she notes, "It feels more cinematic to me — bigger and bolder than we are."

She adds that on *Sinners*, she favored the 50mm Ultra Panatar "because it is a beautiful, wide-close-up lens that gives more context on either side and is also great for a three-shot."

She shot most of the Imax footage — about 20 percent of the movie — with Imax MSM 9802 cameras and 50mm and 80mm Panavision lenses that had been custom-built for Nolan and Van Hoytema on *Oppenheimer* (*AC* Oct. '23). "I liked their softness, and Ryan had confidence in the simplicity of using these two focal lengths to tell the Imax part of our story."

Durald notes that theaters equipped for digital Imax exhibition, but unable to screen 70mm prints, will display *Sinners*' Imax sequences in 1.90:1, and standard theaters will exhibit the entire movie in Ultra Panavision's 2.76:1 aspect ratio. "We were very aware of that on set," she adds. "I like to frame actors and what's most important in the center, which worked to my benefit in post, when we reframed the Imax image for 2.76:1. Most moviegoers will see it that way, but I will shout from the rooftops to as many people as I can to try to see it in Imax and, if they can, on film!"

Durald asked Dan Sasaki, Panavision's senior vice president of optical engineering and lens strategy, to create another custom lens for *Sinners*: a Petzval 80mm for the Imax camera. It comes into play for a dreamlike moment with Smoke and Annie at the end of the film. Durald describes its effect as "heavy aberration, blurred edges with some clarity in the center. I always detune lenses to have aggressive field curvature. I love character in my lenses."

She also used a Canon EF 1200mm USM super-telephoto lens on the Imax camera to capture a full moon, which is often a harbinger of unwelcome guests.

Previous spread, from left: Pearline (Jayme Lawson), Annie (Wunmi Mosaku), Smoke (Michael B. Jordan), Sammie Moore (Miles Caton) and Grace Chow (Li Jun Li) band together to fend off the undead. This page: Writer-director Ryan Coogler and cinematographer Autumn Durald Arkapaw, ASC on set.

“It’s important for me to light from camera and look through the eyepiece to get an instant view of the actors’ performance. Ryan likes to sit right next to me, and when we cut, we discuss the take.”

Imax Considerations

In determining which material would be shot in Imax, the amount of dialogue in a scene was a key consideration, as Imax cameras are too noisy to use for sync sound. Additionally, takes are limited to approximately 2½ minutes (for a 1,000' roll of 15-perf 65mm). “Aware of those restrictions, Ryan and I made a list of what jumped off the page as being for Imax,” Durald recalls. “But when we got on set, we fell in love with the format, and it became a question of how much we could shoot without getting in the way of performances. So, we had more Imax than planned, which was beautiful for our story.”

The Imax and Ultra Panavision formats were nearly all captured on 65mm Kodak Vision3 500T 5219, regardless of the shooting hour or location. “Seeing our nights and days on the same film stock worked to keep a consistent grain structure throughout the film,” Durald says of her decision. Kodak also manufactured a few rolls of Ektachrome 100D Color Reversal film in 65mm that Durald used for some handheld shots of workers jumping out of a truck and walking to the juke. “Ryan and I are fond of portraiture shots,” she says. “Vanessa Bendetti at Kodak was able to work it out and make some [reversal stock] for us, and the footage is gorgeous in an Imax print.”

Durald wanted the images to have a similar depth to an online collection of Kodachrome photographs, shot on slide film, of rural life produced by the Farm Security Administration/OWI in the 1940s. “They have so much clarity and layers to them. It’s important for me that the image has weight to it and feels heavy and textured. It was great to work with a bigger negative and keep my shadows dense.”

She spot metered her subjects at 2 stops under her shooting stop, and rated the film at 500 ISO. “We were brave with darkness and underexposure. The quality of the black level is important to me, as are the various skin tones of our diverse cast, which I wanted to look radiant and have depth. Our colorist, Kostas [Theodosiou at FotoKem], was amazing in the DI at protecting our dusty black level and our filmic look throughout.”

The Big Easy

During two months of prep at Second Line Stages in New Orleans, color was the focus of discussions and testing involving Durald, production designer Hannah Beachler and costume designer Ruth E. Carter. The overall

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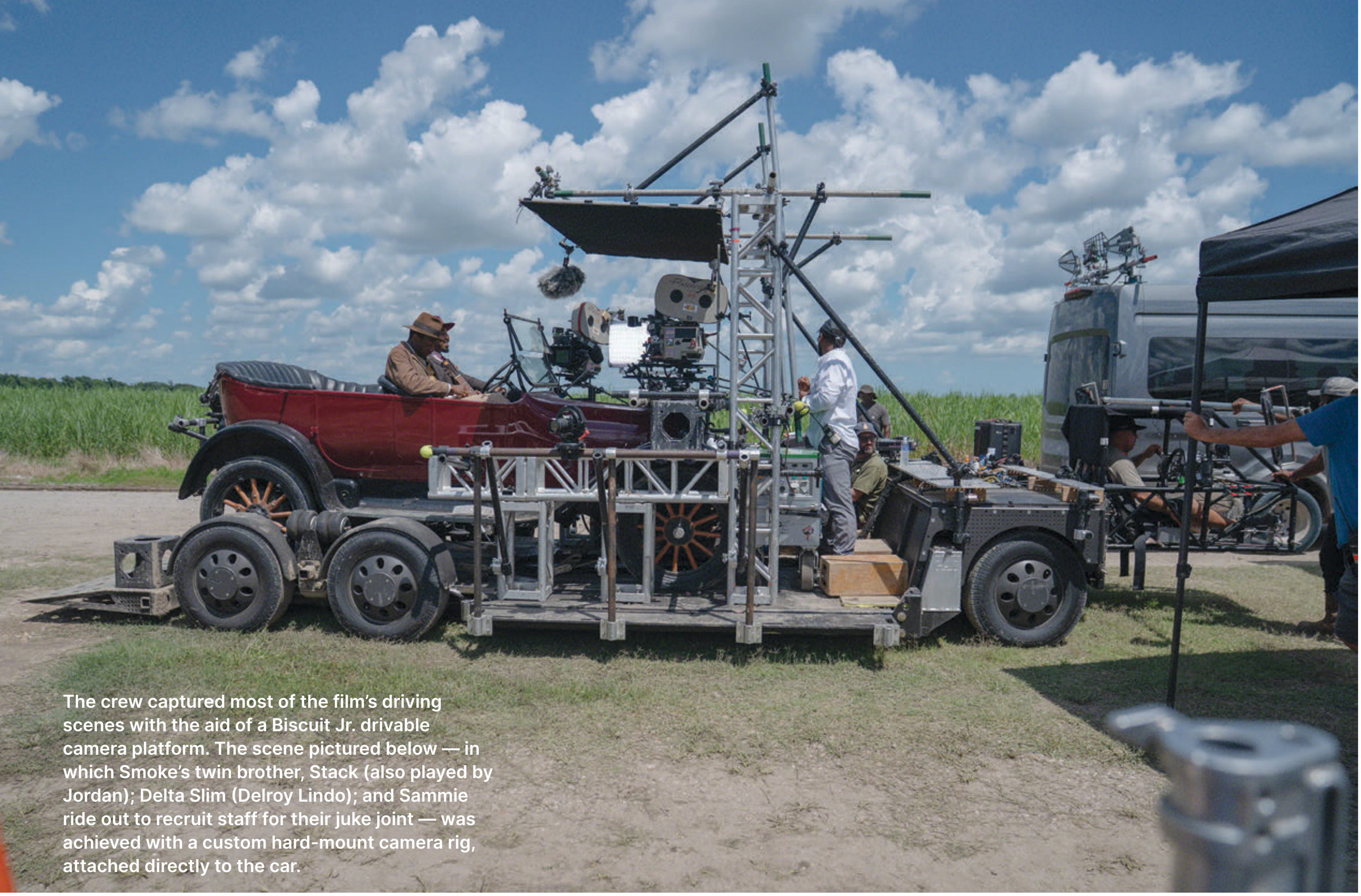


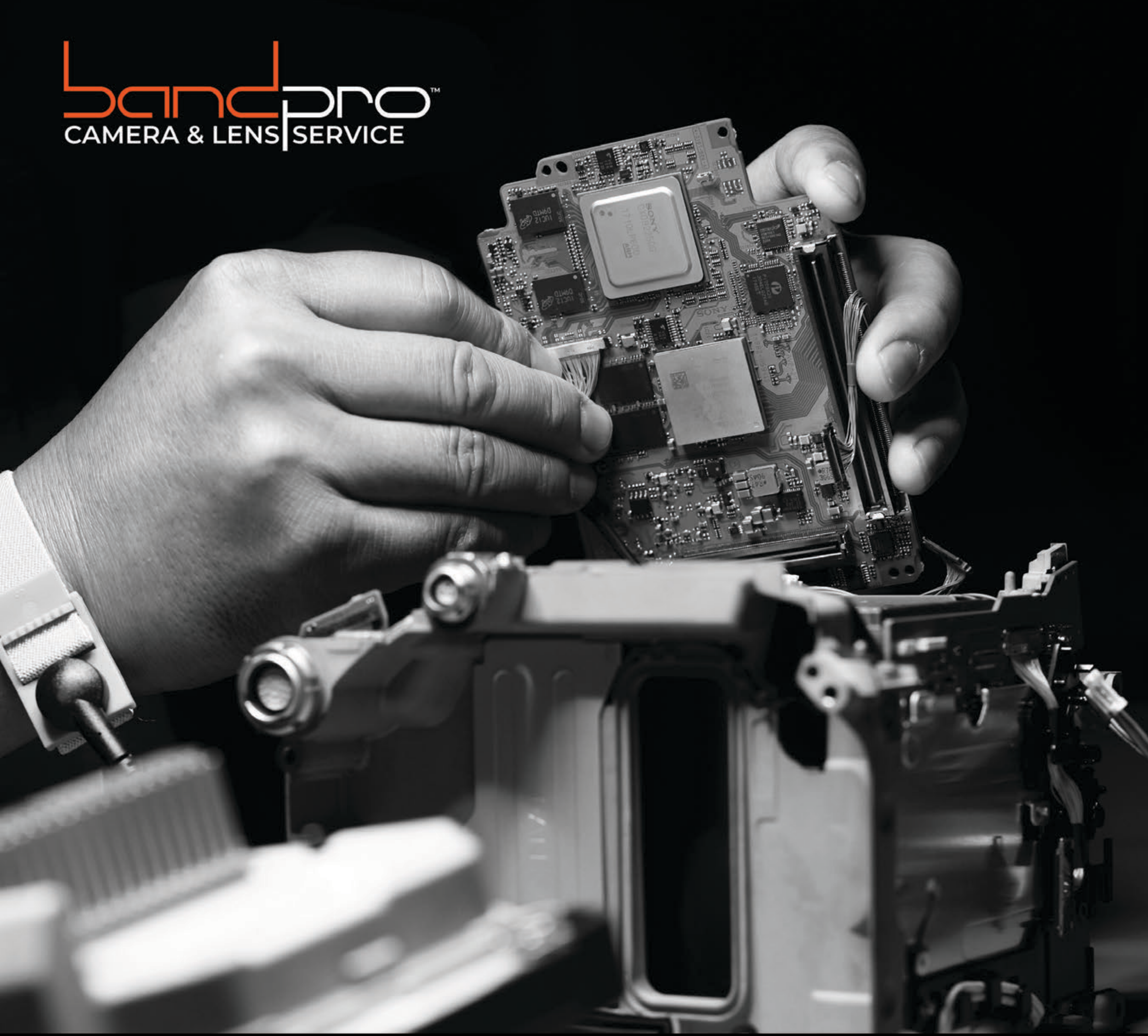
The crew captured most of the film's driving scenes with the aid of a Biscuit Jr. drivable camera platform. The scene pictured below — in which Smoke's twin brother, Stack (also played by Jordan); Delta Slim (Delroy Lindo); and Sammie ride out to recruit staff for their juke joint — was achieved with a custom hard-mount camera rig, attached directly to the car.

palette is somewhat saturated, with a preponderance of blacks, browns and blues contrasting with the white of the cotton fields and the church where Sammie's father preaches. A warm, golden glow is often in the mix.

"Ruth is storytelling with costume and texture, and with Hannah, who built many sets for this, there's so much storytelling in the way a structure was made and which way it faces, as well as the treatment of the wood," the cinematographer says. "I wanted to make sure we were highlighting those intricacies and allowing their work to shine."

She adds, "To have three Black women as heads of departments on a big movie is rare, so I don't take that lightly. It's important for us to make sure these types of stories are being told properly, and that we give our ancestors something to be proud of."

Durald notes that about 65 percent of the film was shot on stage, while about 35 percent was captured on location. The crew shot location work in Donaldsonville, Thibodaux and Braithwaite. At times, these days



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Coogler and Durald prepare to shoot a scene in which Grace paints signage for the soon-to-open juke joint.

Arresting Images: Ryan Coogler on *Sinners*

By Mark Dillon

***American Cinematographer*: You initially wanted to shoot this movie on Super 16mm. How did that evolve into such a different approach?**

Ryan Coogler: When I wrote the script, I knew I wanted to shoot on film, and I knew I wanted Autumn to shoot it. She was working with Gia Coppola on *The Last Showgirl* when I hit her up. I told her I had just bought a Super 16mm camera and wanted to shoot with that. She said, "Great, I'm shooting 16 right now, and I love it. Let's go!"

Then I had a phone call with Sean Durkin, who had just directed episodes of *Dead Ringers*, which also deals with twins, and I asked him how he had worked it. I also talked with his VFX supervisor, who told me he would not recommend Super 16 for *Sinners* because the gate is so small that the image would not be stable enough for the visual-effects compositing of shots of twins — we'd need at least 4-perf 35mm. So, I told Autumn it would be 35mm.

Then I started researching. This story is set in a unique physical environment — expansive, with buildings few and far between. It's just horizon and crops as far as the eye can see. You can almost see the Earth curve. It's an epic landscape. And for our story, [a larger format] started to make sense — the feeling that if something was to happen to you, nobody's coming to help. It's the paranoia that isolation can bring. How do I translate this? I talked to Autumn about visual isolation, the stark nature of the horizon, and this wide frame.

Then I got a call from Jesse Ehrman [president of production and development] at Warner Bros., who asked, "Have you considered large format?" He was talking more from the business side of it — the theatrical presentation — because we have to do what we have to do to motivate people to leave their houses to watch something on the big screen.

The bells really went off in my head at the American premiere of *Oppenheimer*. I had never seen anything like that and felt such an impact from the Imax image. I realized that our epic scale [was suited to that]. Also, we wanted to photograph these Mississippi people from a forgotten time in history clear-eyed, showing the conditions and the reality of that time and place.

I told Autumn we should test for 65mm, and she sent me this email in which she referred to 65mm as bananas. She said, "We could do this scene and that scene on Imax and that would be pretty crazy, and then here, we can go full banana" — Ultra Panavision 70, combining that with Imax. It had never been done before, but the equipment was there for us.

When we went to FotoKem for a screening of large-format prints, I realized 65mm had the texture I had always been after. Seeing footage captured on 65mm and projected on 70mm equipment — specifically Ultra Panavision 70 de-squeezed — was exactly what I was looking for. I told Autumn we had to test all the equipment somewhere flat to test my horizon theory, and she got a crew together and an actor to stand in. We developed that film stock, and man, I was done.

This was your second feature with Autumn. What do you think makes this partnership work so well?

We spent a lot of time on *Wakanda Forever* getting to know each other. I went into that movie with an open mind. I had never shot anamorphic before, and I was open to it. When I made that movie, I was very vulnerable because of the reality of our situation [with the death of star Chadwick Boseman], and Autumn took good care of the film and good care of me. We talk about images in the same way: from an emotional place. And she's very ambitious. She wants every image to be great. She's honest and passionate.

On this movie, it was very cool with her operating the film cameras. I've worked with some of the best operators in the business. When you shoot digitally, you've got the DIT, multiple cameras and operators, and it can get impersonal and distancing. But here, it was fantastic having her on the camera right there with me and the actors. And her use of underexposure is so unique. She makes an arresting image. She sees things in a way that can be unimaginably beautiful. Sometimes she'll call things out that I can't see yet. She'll say, "That shot we just did, make sure you use it." And I've learned to trust that.

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This page: At dawn, a bloodied and battered Sammie makes his way to the local church, where his father — pastor Jedidiah (Saul Williams) — implores him to leave his love of blues music behind and seek salvation. Opposite: A crane arm and Opertec Active stabilized head were deployed to help capture shots inside the church.

were fraught with challenges, including triple-digit temperatures and the need to haul tons of cables and equipment for miles amid unfriendly wildlife. (Key rigging grip Domenic Pacino and rigging gaffer Jason Fitzgerald organized that effort.) In addition, unpredictably severe springtime weather caused delays and destroyed some sets.

The movie opens with an Imax sequence showing Sammie, wounded and in shock, driving to his father's church, and then flashes back to the previous day. (Imax scenes are not restricted to horror and action; they also include respective sequences featuring a reunion between Smoke and his lover, and a cameo by real-life blues legend Buddy Guy.)

An Imax MKIV mounted on a MovieBird MB50XL crane was used for high-frame-rate work, shooting 40 fps for a sequence in which Smoke approaches the camera firing his Tommy gun at a group of Ku Klux Klan members. Durald also shot high-speed on a fiery battle between Sammie and head vampire Remmick (Jack O'Connell).

Ultra Panavision Oner

Coogler appreciates oners, and *Sinners* features a notable example early on. In the scene, Smoke goes to the local grocery store to request some signage for the juke joint, which sends Lisa (Helena Hu) across the street to retrieve her mother (Li Jun Li), who then walks back to the grocery store with her.

The filmmakers initially planned to shoot this dialogue-heavy sequence on the System 65 Studio, but the rickshaw/remote head rig they devised for the camera proved too unstable on the location's bumpy dirt road, so they went with the lighter System 65 High Speed on a Steadicam.

Durald tapped Steadicam operator Renard Cheren, with whom she had worked on commercials, for the heavy lifting. “They have to carry much more weight in this format, but also keep the camera very smooth and frame perfectly,” she notes. “It was Renard’s first time flying those cameras. He practiced in prep and did a beautiful job on many sequences.”

There was scant margin for error in maintaining focus on the shot. “I had a little monitor that allowed me to follow and see the shot,” says 1st AC Ethan McDonald. “As I was tracking with them, it became a question of, ‘Are we with the daughter? Are we with the mom? When do we trade?’ We were all moving and trying to keep ourselves and our shadows out of the shot.”

Durald and gaffer Brian Bartolini lit the grocery shops with overhead soft boxes containing LiteGear LiteTile LEDs through Full Grid. “Shooting from inside-looking-out windows is always the hardest thing for key grip Miguel Benavides and me, because we need to bring up the ambient indoor light level to match the exterior ambient level,” says Bartolini. “Most DPs and directors want to face looking outside because there’s more depth in that direction. So, the set ceiling is the only place to put the lights, and you have to hope the camera never sees them.”

Moving back and forth from interior to exterior also required Durald, at a monitor, to execute iris pulls while McDonald chased after the actors. The effort the shot required was worth it, she says. “It gets the movie’s energy up and helps create excitement as [the brothers] get the juke ready for its opening, and also gives the viewer a good sense of the town. Achieving that shot was very important to Ryan.”

The Juke Joint

Then there is a 3-minute-20-second sequence — five shots stitched together — at the juke party. As Sammie sings the blues, the Imax MSM 9802 moves around the room on Steadicam, capturing the patrons, but also, in a surreal twist, musical figures from the past, present and future — Sammie can apparently conjure such spirits, and they include a hip-hop dancer, a Bootsy Collins-type player and a DJ at a turntable. The camera then goes to Sammie and tilts up to reveal a burning roof — the house is figuratively on fire, a CG effect created using a fiery Imax plate as reference. The sequence ends with an exterior dolly pull-out showing the revelers dancing in the imaginary ruins of the burning mill.

To capture all of the action, the floor of the juke had to be clear except for the performers, Cheren and a spotter who helped him navigate the crowd. McDonald pulled focus from up on a catwalk. He notes, “That shot has many moving pieces that never move the same way twice, so as I watched it unfold, I couldn’t be too rigid. I had to think of what the viewer would want to see, because Imax has a very selective focal plane. In one of my favorite moments in the entire sequence, we circle the crowd and come to a clearing. Depending on the timing, we might have a clear shot of Sammie or one of the dancers. If I decided to focus on Sammie in the mid-ground, I might have missed the ballerina that blasts into frame camera left — but if I held focus in the foreground too long on an empty frame, it might have felt like a mistake. After conversations with Autumn and Ryan, we decided to let the ballerina bring us back to Sammie, where the journey all began. The result is a much stronger shot that ties all of the elements together.” McDonald also had to reload the camera after each 75-second take. “I’d run down the stairs, and the camera threads from the top, so I’d climb up a ladder to get my hands in before lacing it up for another take. It was such an adrenaline rush!”

The juke is where the latter half of the story unfolds, and eventually, Smoke and others have to barricade themselves in to avoid the vampires. The exterior was a three-walled set built on a former golf course. The interior, built at Second Line, was the production’s largest set and where the last few weeks of shooting transpired.

The interior lighting was a combination of toplight and practicals. “It was important for everything to feel real, not lit,” says Durald. “In the

Above: The crew captures a moment in which Sammie plays the blues inside the juke joint, which directly precedes the elaborate oner that unfolds in the same environment. Below, left: Durald angles in on a close-up of Jordan for a shot in which Smoke peers up at a grocery-store sign. Below, right: An Imax MKIV camera mounted on a MovieBird MB50XL crane helps capture a scene in which vampire Remmick (Jack O'Connell) chases down Sammie.

real space, there would be practicals above you or sitting on tables, so toplight felt right. In 1930s Mississippi, not everyone had electricity, so we have a scene [showing them] tapping into the electric line, which allowed them to string some incandescent bulbs in the juke."

Durald and Bartolini determined the best sources to match those practical bulbs and lanterns were 19", 22" and 30" Jem Balls double-diffused with unbleached muslin, which were hung throughout the set and controlled with Variac dimmers.

"We used motivated firelight inside the juke joint from wall sconces and hanging kerosene and oil lamps," Bartolini adds. "But our main motivated light came from the hanging incandescent string lights, or the can lights on the stage. The toplight gave Ryan and Autumn freedom to turn the camera in any direction."

Ambience was provided by Arri T12 Fresnels bounced off unbleached

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Above and below: Stack and Smoke begin their long day's journey into night, which culminates in a clash between the brothers when supernatural forces pit them against one another. Right: Using an Imax camera, Durald and Coogler capture an impromptu magic-hour shot with the aid of Jordan's stunt doubles. The sunset, Durald says, was "just something I saw when we wrapped, and Ryan ultimately used it in the film."

muslin in the ceiling. The lights were gelled with ½ CTO to obtain a 2,300K hue. Above the ceiling were 70 Arri SkyPanel S60-Cs set at a moonlight 4,700K temperature.

"Making the Best Shot"

When Steadicam was not called for, Durald operated the A camera. "It's important for me to light from camera and look through the eyepiece to get an instant view of the actors' performance," she says. "Ryan likes to sit right next to me, and when we cut, we discuss the take." B-camera operator Josh Medak also captured the action. Noting Coogler's preference for running a second camera, Durald says, "There are so many amazing performances not to miss. But it's important where you put the B camera not only for performance and storytelling, but also for lighting. We like to get the right amount of shots to cover the scene, but we're thoughtful about them."

Twinning Jordan was accomplished with a combination of split-screens, body doubles, motion control and a custom HaloRig for complex

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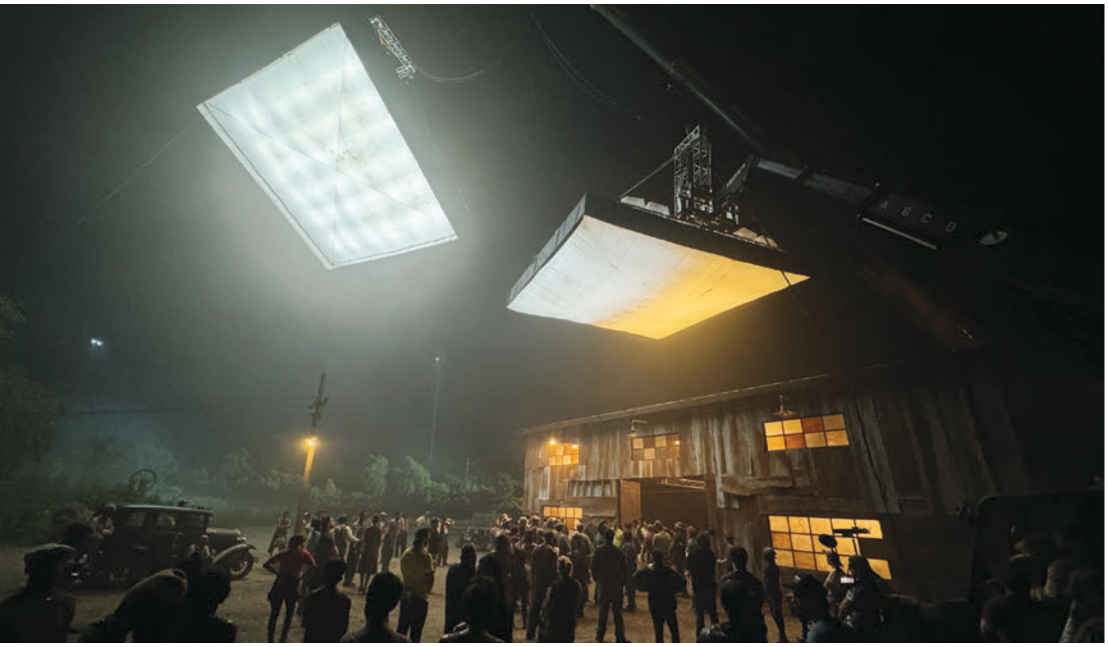
Film Stocks | Kodak Vision3 500T 5219, Ektachrome 100D 5294

interactions. A 25' TechnoDolly enabled repeatable moves for dual shots of Jordan, which were composited in post. "Our HaloRig's 12-camera circular body rig captured 360-degree head-performance reference data," says Durald. "This footage was then used to help seamlessly replace the head of a carefully matched body double with his performance. All shots were supervised by visual-effects supervisor Michael Ralla, who prioritized natural blocking and minimal constraints. Coordination between all departments was essential, especially on our demanding twinning days."

Despite the project's technical complexity, the filmmakers embraced every challenge it posed. "Whether it was Steadicam or crane work, we didn't let the format and the large cameras weigh us down," Durald says. "We were really just concerned about making the best shot. Ryan is a fantastic leader and was game for anything. To be able to think like that, you have to be brave, inspired, and have an amazing team. I don't feel this story could have been told in any other format. It was meant to be." ⓿



Soft boxes are raised above the juke-joint exterior to help light a moment in which a horde of vampires approaches the partygoers inside.

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*Thunderbolts**: A Motley But Super Crew

Andrew Droz Palermo, ASC reveals his creative strategies for the latest Marvel adventure, which combines anamorphic and Imax aspect ratios.

By Douglas Bankston

The action feature *Thunderbolts** is the concluding film in Phase Five of the Marvel Cinematic Universe. The Avengers are gone, but the CIA director needs a team of superheroes for a critical mission. Enter the Thunderbolts, a misfit crew of antiheroes and reformed villains whose fitness for the assignment is, like most asterisked things, questionable.

Their task is to reign in Bob (Lewis Pullman), the subject of Project: Sentry, a government experiment designed to create a more powerful super-soldier serum. Bob (aka Sentry) battles mental illness, which, when mixed with superpowers, makes for a volatile cocktail that constitutes the Void, Bob's dark alter ego.

Good luck, Thunderbolts.

To make the Disney-Marvel film, director Jake Schreier tapped cinematographer Andrew Droz Palermo, ASC, whose credits include *You're Next*, *The Long Dumb Road*, *A Ghost Story* (*AC* Aug. '17) and *The Green Knight*. As Palermo chaperoned the final reel locks for *Thunderbolts** on the Disney lot, he spoke with *AC* about the project.

***American Cinematographer*: *Thunderbolts** has a grander scale compared to your previous work, but you also shot some episodes of Marvel's series *Moon Knight*. Is that how you became connected with this project?**

Andrew Droz Palermo, ASC: Those small movies from bold directors are the things that have staying power. It feels like those works speak to people, you know? I wanted to bring that to this film. I was on a list of approved cinematographers based on *Moon Knight*, but it still was very much up to the director, Jake Schreier. He reached out because of my work on *The Green Knight*. I actually had to pass on this movie initially, because I was doing [*Mother Mary*] with David Lowery, and that presented a scheduling conflict. So, David and I went off and shot that movie, while *Thunderbolts** didn't go into production because of the subsequent strikes. When they were booting back up, Steve Yedlin [ASC] had to exit the project for the next *Knives Out* [*Wake Up Dead Man*]. At that point, Jake reached out again and said, "Don't say no this time!"

What did you choose to shoot with?

The Arri Alexa 35 [4.6K sensor, 3:2 Open Gate] with Panavision's Ultra

UNIT STILLS BY CHUCK ZLOTNIK. ALL IMAGES COURTESY OF MARVEL STUDIOS.

Panatar II anamorphic lenses. Our aspect ratio for most of the movie is 2.39:1 ["letterboxed" from the full-sensor capture of 1.95:1], but we also have Imax scenes where the ratio is 1.89:1. We were looking for optics that would allow us to move fluidly between the more standard widescreen ratio and Imax. That issue has bumped me in the past, in that you can feel the shift when an Imax scene appears — if you're watching the movie at home, you're wondering why this part looks so different than all the other parts. It's a headache and a financial burden for a movie to carry Imax lenses in addition to standard sets.

When we shot Imax, we just got rid of the letterboxing, opening up the frame to 1.89:1. At Panavision, [ASC associate member and senior vice-president of optical engineering and lens strategy] Dan Sasaki helped us tune the lenses to what I was looking for; that included building a few wider focal lengths, because I knew after doing some viewfinding with Jake that he really wanted to shoot on the wide side. Panavision built us a 27mm and a 24mm and a couple of 18mm lenses. We didn't use the super-wide ones very often, but we lived between a 27mm and a 50mm.

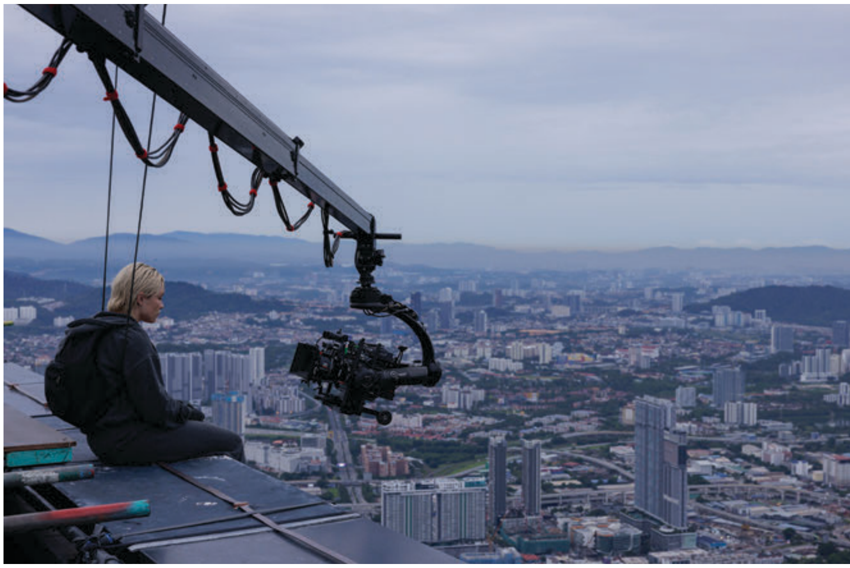
The other thing I liked about the Ultra Panatars was the 1.3x squeeze. I think one of the downsides of anamorphic is that the depth of field is just so shallow that you're not getting to see actors in the spaces that inform character and story; you lose a little bit of life. The bonus of the 1.3x squeeze and being on the wider side is that the actors appear as part of their environment until we come in on a longer lens for closer work.

Did you shoot at a deeper stop as well?

I tried to be at a T4, and if we were outside, I didn't mind taking it all the way to T16. That's not exactly fashionable at the moment, but I thought, "Here we are in Utah, shooting among these beautiful mesas, so why would we want the focus to drop off?" That was a beautiful thing about this movie: We had sets, we had environments, and there was very little bluescreen. It's a much more grounded Marvel film.

How much of this movie is in Imax, and how do you feel about alternating formats?

It's somewhere around 30 minutes. Personally, I think the alternating format is weird. I don't mind it when I'm in an Imax theater designed specifically for that experience.



Opposite, from left: Bucky Barnes (Sebastian Stan), Ghost (Hannah John-Kamen), Yelena Belova (Florence Pugh), John Walker (Wyatt Russell) and Alexei Shostakov/Red Guardian (David Harbour) watch a new enemy with apprehension and dread. This page, top: In Kuala Lumpur, Yelena prepares to jump from the roof of the world's second tallest building. Above: A camera attached to a Filmotechnic Flight Head Colibri mounted on a Technoscope F27 telescoping crane wraps around Pugh as she prepares to stand, tiptoe to the building's edge, and leap off. Her fall was slowed to a stop by a descender rig built by the show's stunt-rigging team.

Production designer Grace Yun incorporated source lighting into the architecture of key sets, including a seemingly impenetrable vault.

We shot Alexa 35 for the majority of the film, including the Imax scenes, but there are a few aerial shots in the film that we did with a Mini LF, as well as a few specialty shots for action scenes that were done with the Red Komodo-X.

Imax agreed to certify the camera based on the de-squeeze of the 1.3x anamorphic. For this movie, the Imax/2.39:1 version won't go anywhere but Imax screens. *Thunderbolts** on standard screens and at home will be 2.39:1.

How did you and the director develop your approach?

Jake is very methodical, and he knows what he wants. He likes to shot-list by himself, and then we discuss it, have a PA or one of the producers stand in, and shoot rough video boards in the office. We'd go beat by beat and cut them together, especially for action scenes. That methodology made for a movie that is very "considered." The camera would do two things at once: Rather than cutting to coverage of an object, our camera would shoot the character looking at the object and then move to that object. We didn't shoot coverage for the sake of coverage.

In terms of lighting, we didn't want to make an extremely glossy movie. Sometimes those rough edges are hard to accept when you're in my position — you'll think, "Oh, I could make this look better" — but looking at it more broadly, I think the rough approach really added something to the movie. Jake always was pushing not to beauty-light too much, not to worry and just shoot. The movie is still *lit*, certainly. It's just a matter of how lit or how much I could hide the lighting with how soft it was — not a super-expressive lighting style.

Can you describe an example of those choices?

The beginning of the movie is that way. There's a shot in Kuala Lumpur where a building explodes behind Yelena [played by Florence Pugh]. Impulse would be to come prepared with 18Ks and try to light her face, particularly as she's walking. We went with the simple approach, adding a little bit of negative fill that we walked along with her. That was it — I don't recall even using a bounce card. We let the environment live, played the camera handheld, tilted up when the explosion happened, tilted back down to her, and kept walking. We aspired to have the feeling of a real, lived-in world. Also, the explosion was real, not CGI. We had one take because it would have been hours to reload, and the FX guy with his finger on the trigger was just shivering right before Jake pointed at him to do it. Then, bang! It's an incredible feeling to crush it in one take and say, "We're out of here!"

Tell us about your crew.

When I got the job, my first call was to key grip Chuck Crivier, whom

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Yelena, Walker, Ghost and Red Guardian speed through the desert in a stretch limo as they're pursued by military vehicles during a high-speed chase.

I've worked with a lot. He had done some Marvel projects in the past, and he was technically already onboard this movie with Steve Yedlin, as was gaffer Rafi Sanchez. It can be weird to work with somebody you've never worked with before, especially on something of this scale. A gaffer, for me, is such a confidante, but Rafi's resumé is astounding. I met him over Zoom, and we had an immediate kinship. This film was such a big jump for me in scale, and having those two guys and their teams behind me made it fun for me every day. The 1st AC was Greg Irwin out of Atlanta, who brought in his camera teams except for the operators. Jake and I had lots of discussions about the operators, because Jake's very particular with camera operating and really has a sensibility for it. He brought in Paul Sanchez, who was his operator on the *Star Wars* series *Skeleton Crew* [*AC* March '25]. Paul was such an asset for us. Our B-camera operator was Matt Petrosky, who also did Steadicam. I've loved Matt's work for a long time. I had an ideal situation with that crew.

What was your approach in using two cameras?

We generally designed around one camera, then we'd look at the batch of planned shots to strategize ways that B camera could help us check off shots — any way we could knock those out where it didn't compromise the lighting or the A-camera move. For me, the best way always is to go 90 degrees from the other camera. So, if it was a three-shot frontal from A camera, and we also wanted a three-shot down the line of stacked actors because they start to look at each other, that's where B camera could really come in to help. That approach was ideal for lighting as well, because I avoided cross-lighting at all costs. Those two camera angles more or less complemented each other, so the strategy worked nearly every time. If I didn't have anything explicitly for the B camera to do, I would just get an alternative angle of a close-up or inserts. Whenever there wasn't a shot for B, it would get built out for the next complex shot so we could leapfrog cameras.

It sounds like you really were planning this for the edit.

The movie feels like the camera is always in the right place seeing the things you need to see. There's a clarity to it. Jake is a stickler for the 180-degree rule, and he will not break that line. Sometimes when you get three or four cameras, they can do things that break the line, and it gets confusing in the edit.

What were your locations?

We shot in Malaysia, Utah and Atlanta [at Metro Studios]; we had splinter units in Washington, D.C., and New York; and we shot some pickups in Los Angeles and additional material in London. The crews at every location were incredible.

What would you describe as your most challenging scene to pull off?

There's a big day exterior that's set in New York City, on a set built at a former OFS plant in Atlanta. We shot for around 15 days, and it included the entire superhero group. Some of the sequence is just dialogue, but then it turns into

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a really big action sequence with a lot of destruction. Shooting over so many days, I was really concerned about light continuity. A typical method would be to use construction cranes holding diffusion overhead, big soft boxes that blocked the sun, but the square footage of this backlot was so immense that we would have needed an incredible number of construction cranes, at $20,000 each per week — untenable, financially. And every time one had to move, it would have taken 30 minutes.

So, early in preproduction, I pitched a kind of crazy idea: Diffuse the entire backlot by silking overhead. Only a really savvy producer would see the value in that, so my hat is off to Jason Tamez. It was a lot of money and labor, but silking 68,000 square feet allowed us to put the cameras anywhere, anytime — rain, sunshine, overcast — and still maintain a nice, soft, even light. The sun was actually backlighting, and we tended to shoot toward the backlight. Diffused as it was, we could still feel the directionality of the sun.

The rigging team built a truss structure across the entirety of the set, and we had the pieces of overhead diffusion [silks] on pulley systems, so we could take them in and out individually. Atlanta can be very windy at times, so keeping the diffusion as individual pieces, even though they overlapped by 12 inches or so, allowed the air to flow through them freely.

There's also an important story point that played into that decision:

Above: Pugh and cinematographer Andrew Droz Palermo, ASC banter between takes. Below: Palermo (crouching at left), director Jake Schreier (seated) and Russell discuss an upcoming scene.

Throughout their (mis)adventures, the heroes find themselves in a series of dire predicaments. From top: The heat rises as they try to escape a vault; the all-powerful Bob (Lewis Pullman) is confronted by soldiers; four of the cohorts are held hostage.

These characters don't have shadows, then something happens to them and they become *just* shadows, which was done with visual effects. If there were real shadows and VFX shadows in the frame at the same time, it would be confusing, so it was essential for the light to be diffused. Also, many hats off to Jose Barrios, the keyrigging grip, and his rigging team — and to Chuck and the engineers — for coming up with a solution at that scale for this insane idea. And 2nd-unit director George Cottle and cinematographer Paul Hughen [ASC] did great work. The sequence has car crashes, helicopter crashes, traffic, 200 extras. It was the most complicated thing I've ever put onscreen, by far.

With the silk overhead, did you have to tuck lights underneath?

I did not, actually. Sometimes I'd bring an additional diffusion layer even closer to further soften things; we'd bring in a 20-by-20 of [TRP] Magic Cloth on rolling stands and put that above the actors as a double break, because the sun can be quite toppy at noon and can cause "raccoon eyes." Additionally, when possible, we'd bounce three 18Ks off of unbleached muslin and back through Magic Cloth to provide a bit of side key. The overheads, as I mentioned earlier, were silks.

It was summer in Atlanta, and we had essentially created a greenhouse — the set could become unbearably hot. But I'm really happy with that sequence, and I think it stands up to many of the big sequences we've seen in other Marvel movies.

Did you try to simplify lighting setups in interiors as well?

When it takes a lot to make things look real, I always think of that line in *Boogie Nights*, when Ricky Jay's character is debating with his producer over making one of the porn films "natural," telling him, "Don't you understand? It takes a lot of light to make it look natural." I'm continuously learning where the right light at the right place does it better than a ton of lights in the wrong place. For a lot of the interior spaces, I have to credit the production designer, Grace Yun. She really thinks about light and wants to have conversations about light and where a window might be useful to me if she's building a set.

I had a great collaboration with Grace and her team, and they really helped me to motivate the lighting. A lot of the sets had built-in lighting as a design element: wall scrapes, accents around doors, or overheads. Grace and I collaborated on placement and found ways to rig [Creamsource] Vortex 8s, [Arri] SkyPanels or

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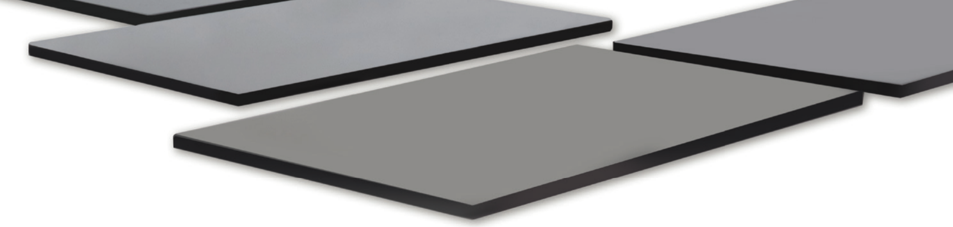

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After battling their way into the Watchtower (formerly known as Avengers Tower), the group is greeted by manipulative CIA director Valentina Allegra de Fontaine (Julia Louis-Dreyfus).

[LiteGear] LiteRibbon. Grace would help find ways to incorporate light into her design if I felt I needed more in certain areas based on blocking conversations with Jake.

You could just key off those?

Exactly. Or, they *were* the key. Often the set would be more or less lit, but I would maybe use a 12-by-12 with a bounced SkyPanel 360 with an Octodome to add a little fill.

So, larger sources farther away as opposed to smaller sources closer to the actors?

I tried to do that where possible, but sometimes the spaces didn't allow it. The first act of the movie is in a mazelike building with not a ton of room. I'd do a 12-by of Magic Cloth if I could. The guys used LED strips to make me a few versions of a super-soft, handheld, battery-powered light, and I tucked those in places to put a little catch-light in the actors' eyes. Jake didn't want to wait for lighting, and I tried to accommodate him wherever possible.

That sounds almost like an indie approach.

It was, at times. When I first saw a trailer, I was uncomfortable, particularly with a scene at the beginning of the movie featuring Yelena and Alexei at his house. It is not glossy at all in a way, kind of because we were really pressed for time. I was like, "What is this shabby-looking little indie movie?" But the appeal of this movie is that it is so different than the other Marvel movies. It feels real and raw; there is a grittiness to it.

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Members of the supercrew stroll through the wreckage of their street battle in New York City.

How long was the production?

We pulled it in at 71 days, and it was meant to be 72. It was a short schedule considering the scope of the work. We'd be shooting four pages of dialogue with five characters, and I was like, "Let's go!"

What's your favorite scene?

There's a series of interior scenes at the end that are tied together through one lighting approach. We did a lot of lighting tests for those scenes, and they were all lit with huge banks of Creamsource Vortex8 units positioned outside the windows and aimed through Magic Cloth. If the window was a relatively small 4-by-4, the bank outside the window would go well beyond the window frame, making for a 20-by-20 bank of around 30 Vortexes. Bryan Booth, our lighting programmer and dimmer-board operator, ran a light-mapping app called MadMapper and sent vertical-bar shapes of light across the bank — if you watched a cast shadow on the ground, it would repeatedly move left to right. That provided a subtle, uneasy feeling of not being in a real space until the action started happening, when we dialed up the light motion more aggressively.

What impact did the movie's visual effects have on your cinematography?

This was on a different scale compared to my other work, [but] I think we brought out a bluescreen maybe twice. [Marvel Studios VFX supervisor] Jake Morrison and I talked early on, and I floated the idea of processing colored material instead of bluescreen. For instance, if we were shooting a night scene, we would use black instead of blue. It turned out that was what he had been preferring recently: to have the color they're keying match whatever should be there. If it was dark and it should be night sky, then black should be behind them. If we were out in the desert, we'd go with sand-colored material. I was happy about that because the bleed of blue- or greenscreen can be horrible.

Jake also pushed for references. For example, if a character is supposed to jump super far, we'd put somebody on a wire and have them actually jump and do the camera move and tracking. Whether the VFX team turns them into digital characters or needs to remap the entire shot, they at least have real references in the original photography for comparison. They might see a little back-edge light on the character that's missing on the digital character. That methodology made the visual-effects integration really good. As I colored the movie, I forgot whether some shots had a visual effect or not. Really incredible work.

How were your dailies and grading processes?

I worked with the amazing [Company 3 senior colorist and ASC associate member] Tom Poole at the Disney lot. The team of Evan Jacobs, our creative finishing supervisor at Marvel; Kyle Spicer, my DIT in Atlanta; and our dailies colorist at FotoKem, Mark Sherman, made sure our dailies were in great shape, using a show LUT that Tom and I designed. The LUT was based on camera tests I did at Panavision and later tweaked once I did additional testing with the cast in wardrobe. Dailies required only small adjustments to color, highlights, shadows and midtones. Then, in the final grade, it was all nuanced sweetening and secondary windows — more contrast here, popping a face there, etc. The show LUT was used all the way through finishing. I have to say, this has been one of the most hands-off color processes I've ever had.

We graded and finished the movie in 4K, with a Dolby EDR pass, an HDR extended-range pass and an Imax pass. The differences between those passes were minor. Home video received a bit of a contrast bump because no one at home has viewing conditions without reflections and stray ambient light.

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Final Destination Bloodlines Delivers High-Rise Horror

Christian Sebaldt, ASC ventures into the volume with directors Zach Lipovsky and Adam B. Stein.

By Joe Fordham

The *Final Destination* franchise, which director James Wong and cinematographer Robert McLachlan, ASC, CSC kicked off in 2000, has offered a cavalcade of protagonists who have battled premonitions and paranoid attempts to cheat death, triggering domino effects of grisly disasters that prove there's no escaping the fickle finger of fate.

For the latest installment, *Final Destination Bloodlines*, directors Zach Lipovsky and Adam B. Stein teamed with Christian Sebaldt, ASC to inject the proceedings with a wicked sense of humor and horror-comic panache. The threesome first collaborated in 2007 on Steven Spielberg and Mark Burnett's Fox reality/competition series *On the Lot*. Sebaldt went on to work with Stein on a pilot and then shot additional photography for Lipovsky and Stein's 2018 feature *Freaks*. He was keen to interview for *Final Destination* producers Sheila Hanahan Taylor and Craig Perry.

Emotional Approach

Bloodlines connects events from previous entries in the New Line Cinema series via a troubled college student, Stefani Reyes (Kaitlyn Santa Juana), who discovers a family curse that stems from an incident in the 1960s in which her grandmother, Iris (Brec Bassinger), intervened during a disaster in a vertiginous restaurant, the Sky View.

The juxtaposition of family drama and horror required a sure hand to steer the visual plan, and Stein notes Sebaldt "is incredibly versatile. On a movie like this, where there were so many technical challenges and also emotionally intimate scenes, Christian could do it all. We were confident that whatever we threw at him, he'd be able to make it look beautiful. And we also found he shared a willingness to approach scenes emotionally first. Whether we were creating a scare or feelings of suspense, romance or tenderness, we achieved that visually by first coming at it emotionally. With Christian, it's always story first."

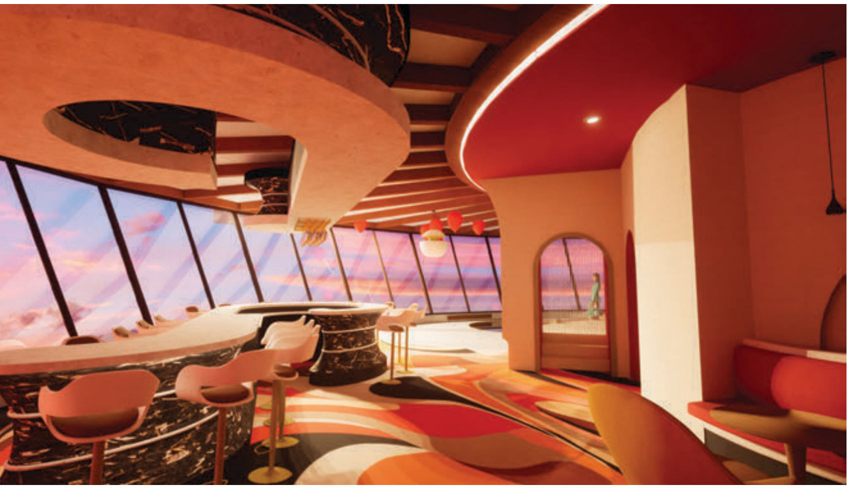
The filmmakers explored visual motifs with digital previs. "Adam and Zach had such a wonderful grip on balancing drama and comedy," Sebaldt says. "They mentioned early on that they wanted to have contrast within shots. That meant adding something bright deep in the background, like a lamp, window or a door that allowed light in. We had 3D computer models of all the sets so we could decide to put a window here, place the door there. For instance, we had a long dialogue scene in a hospital room that Zach and Adam wanted to be very dark and creepy. I asked production designer Rachel O'Toole to include a sconce light on the wall, which gave me the needed contrast through that scene."

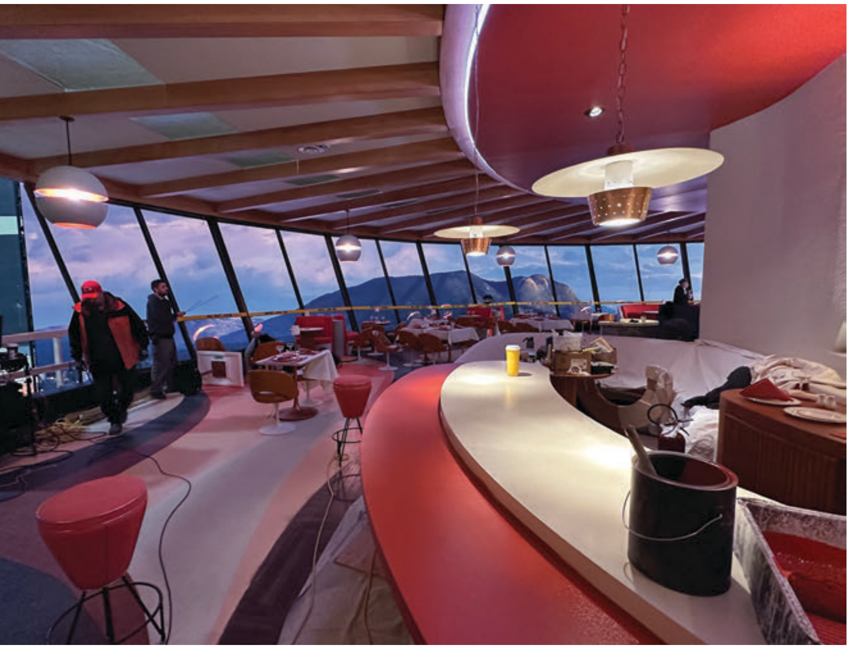
Tower of Terror

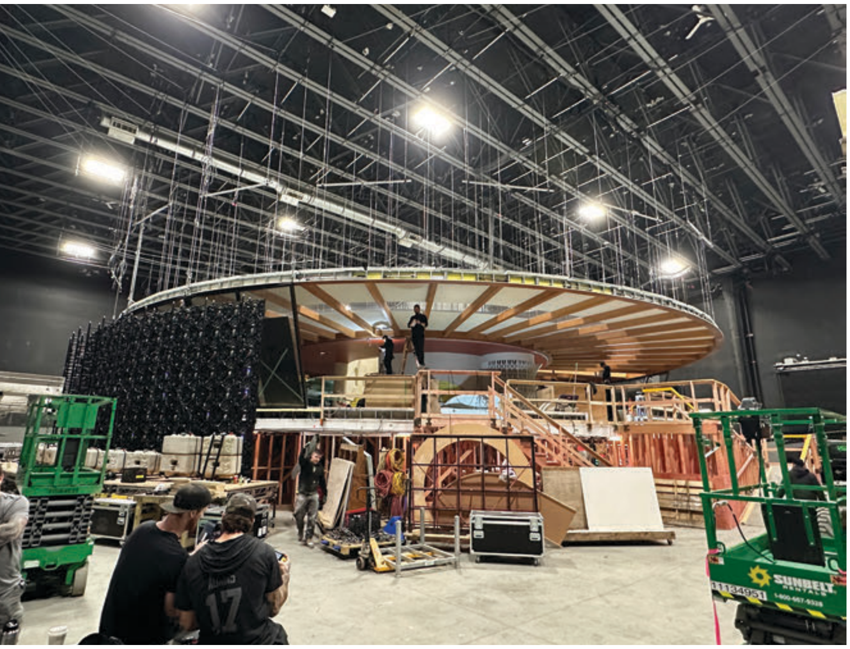
Set models were crucial for planning the complex sequence at the Sky View restaurant that opens the film. "That was a 360-degree set," Lipovsky says of the flying-saucer-like lounge, which sits atop a 400' concrete tower. "It was nearly 100 feet in diameter, surrounded by an LED volume that we shot at 'sunset' for four weeks. To prep that, the art department built a 3-foot foam-core version that we could shine a flashlight in to figure out the position of the sun. We wanted to backlight as many shots as possible as the sun was setting. We'd place an iPhone in the model and move the light around to see how light would play. That was extremely helpful. We wanted to do things with the volume that every volume expert was telling us wouldn't work, like having the direct light of a setting sun coming through the volume with correct parallax."

Shooting the sequence within an LED volume, however, was not a given. Cost projections, technical parameters and aesthetics all came into play. "Because the restaurant was supposed to be so high off the ground, and our set was surrounded by 11-foot-tall, 5-foot-wide windows, we needed the vista outside to be as spectacular as possible, and we needed to keep that safe," notes Sebaldt. "This giant set had to be built 8 feet off the ground so when we approached the windows with a camera, we wouldn't see the stage floor. And the set was unbelievably heavy. Each window weighed 450 pounds because it had to be real glass — Plexiglas attracts dust and scratches easily — and solid enough so it wouldn't break if somebody leaned against it."

For creating city vistas, the filmmakers reviewed options such as Translites and bluescreen, but respective issues of parallax and blue contamination made neither option attractive, especially for visual effects. "I advised against shooting with bluescreen," says visual-effects supervisor Nordin Rahhali. "It would have been an absolute nightmare to try to fix all the reflections and blue spill in post. But it was a challenge to make the restaurant feel big enough inside a volume that would accommodate the size we needed. We ended up building a custom volume."







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Left, from top: A frame capture of a full-3D previs of the Sky View set, rendered in Twinmotion and modeled in Rhino; the set during construction at Bridge Studios; a custom-built LED wall provided the outside view through the set's surrounding windows. Above: Iris (Brec Bassinger) amid the film's inciting incident.

LED-Wall Environment

The production selected Bridge Studios in Burnaby, British Columbia, Canada, to house the LED array, working with lead visual-effects house Pixomondo. "Making that decision was extremely down-to-the-wire," says Lipovsky. "We knew they needed a long lead time not only to build the wall, but also to create assets for what went on the wall. But once we made that decision, we convinced the VFX team to take the money we would have spent on bluescreen composites and put that into the volume. The next step, which was really exciting, was working with our production designer to make the set as reflective as possible, doubling down on the fact that we had this view outside the window. Rachel lined the set with mirrors and copper plating, everyone was wearing silver necklaces, and the floors were shiny!"

When the Sky View build was mostly complete, Pixomondo Creative Services surrounded the set with a 240-degree 24'-tall LED wall that had a circumference of around 200'. The array comprised approximately 1,500 ROE 2.8 Black Pearl BP2 LED panels, 12 panels high, with a riser a little more than 3' above the studio floor. Pixomondo virtual-art-department (VAD) lead Christopher Cox oversaw the installation with the studio's team, working with Pixomondo virtual-production supervisor Phil Jones. In-house VFX supervisor Ryan Freer completed work in postproduction.

While the view of the LED array outside the windows provided an illusion of scale and depth via imagery of the surrounding vista, the setup itself was a tight fit. "We built the wall next to the cantilevers at the top of the set," says Rahhali. "The volume covered the view from inside the set so Christian could move his cameras close to the windows, but we only had about a 2-foot gap [between] the top of the set and the LEDs."

To create city backgrounds, the production used a DJI Inspire 3 drone and a Peacemaker Filmworks custom heavy-lift drone equipped with three 6K Red Komodos to shoot 180-degree plates at 400' elevation above Vancouver at sunset.

Pixomondo stitched multiple passes together to create 360-degree plates, then combined lidar-survey geometry and drone photogrammetry to generate a 3D environment. "The city was supposed to be 'Anywhere, America' in the 1960s," Rahhali notes. "It was a Pacific

> **"This giant set had to be built 8 feet off the ground so when we approached the windows with a camera, we wouldn't see the stage floor."**

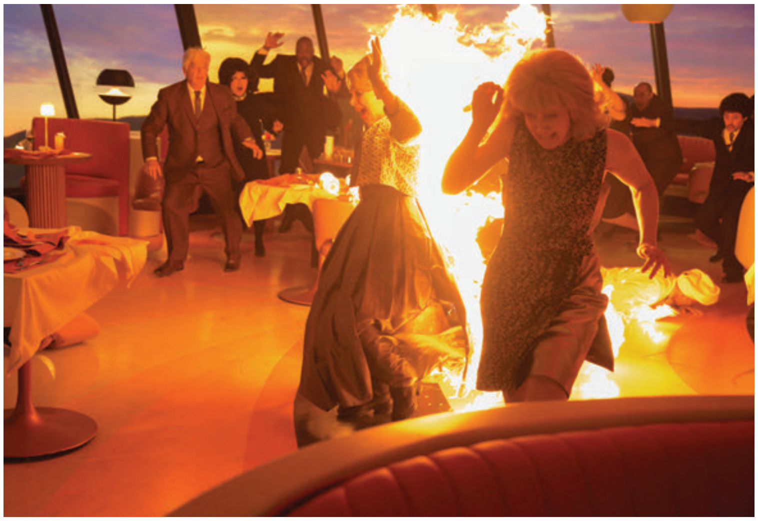

PHOTO BY ERIC MILNER.

To properly capture this stunt, Christian Sebaldt, ASC notes that he "went from T2.8 to a 5.6, and we brought up the brightness of the LED world outside, which accommodated the brightness of the fire."

Northwest-style city with a port, using Vancouver as a template. We tried to incorporate as much drone photography as possible into our digital matte paintings, and then art-directed it to the directors' brief." Pixomondo generated animated details using a procedural city-building tool in Side Effects Houdini. "It could generate streets with trees, automated traffic and boats," Rahhali says. "That gave us the base in 3D that we lit and rendered, and combined with high-resolution details and layers of digital matte painting."

Pixomondo imported a real-time version of the 3D city model into Unreal Engine and configured an inside-out camera-tracking setup via Stype RedSpy trackers, which enabled the three-dimensional vistas to align with camera. "The trackers told the volume where our cameras were in the set, and the Pixomondo Unreal playback unit then created the frustum for each camera," says Sebaldt.

Adds Rahhali, "The tracking worked off reflective markers. The VAD team mapped thousands of markers across the ceiling of the set. The reflectors blended into the set and were invisible except to our infrared RedSpy sensors mounted to the [Sony] Venice 2 [cameras]. For each new camera position, the system knew where the camera was in 3D space, and it could realign the content on the wall to the cameras."

Sebaldt captured the Sky View action primarily with three Venice 2 cameras (at 8.2K), along with two Blackmagic Cinema Camera 6K Pros for additional perspectives. "In recent years," notes Sebaldt, "I have used the Venice 2 on several features and TV series, not just for its pleasing images and great latitude, but also for its eight built-in ND filters and its super-clean 3,200 ISO. The NDs and ISO are remote-controlled by the DIT and can be changed in seconds. I use my Blackmagic cameras on every project. The Blackmagic Raw files intercut flawlessly with the Sony Venice 2. Imax gave me the green light to use them on this film after I screened a test for them. And I used the Blackmagics on many sets and locations as my go-to extra angles."

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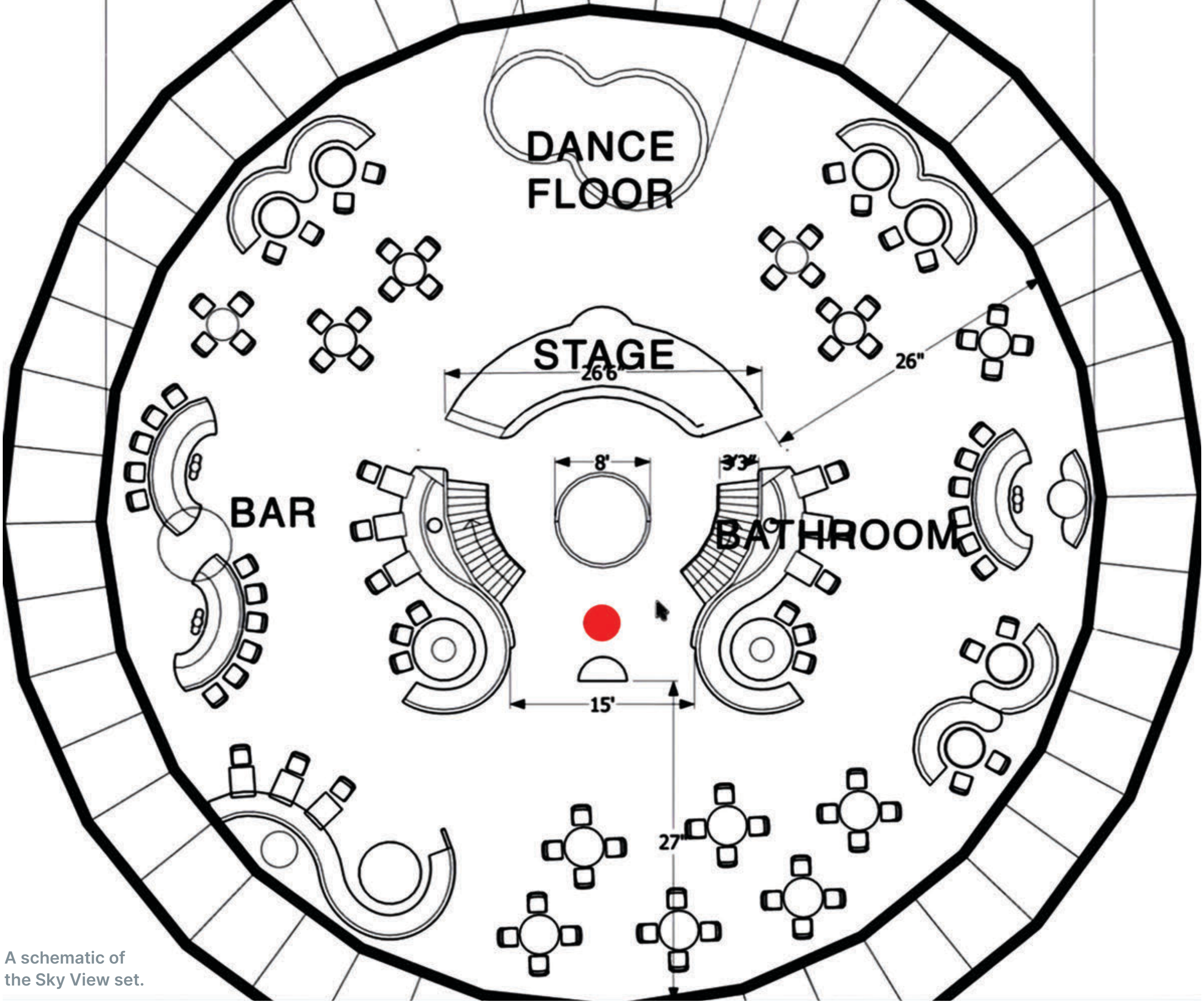


A schematic of the Sky View set.

Sebaldt shot in 17:9 format — at "8.2K with no masking in camera," he says — to give the filmmakers the option to enhance moments of terror and peril by changing the aspect ratio from 2.39:1 to Imax 1.90:1. "We had two frame lines visible on camera and also the monitors, and framed every shot for 2.39:1 while keeping 1.90:1 clean on top and bottom, when possible — and when not, we reframed in the DI or had VFX clean them up for us."

During prep, Sebaldt notes, he asked Bruce Markoe, head of postproduction and image capture at Imax, "if we could avoid using their 1.43:1 format, since a lot of our film needed width, not height, and having wide sets with many characters in them would have been awkward to frame in 1.43:1 — and I got permission."

The Sky View's interactive lighting casts a romantic glow around Iris and her fiancé, Paul (Max Lloyd-Jones), as they enter the space. "We had a shot where Iris and Paul look over at some champagne glasses on a tray," Lipovsky says, "and inside every champagne glass you can see the entire restaurant and the view reflected. A lot of DPs who had worked on volumes told us what sells it is when you have a direct source or a bright reflection bouncing off the floor and shining into the lens — that's when your brain reads, 'This is real.' So, we tried to do as many shots as we could where the light was bouncing back. That was critical to the horror, because what makes the *Final Destination* films horrific is the feeling of everyday occurrences and 'this could happen to you.'"

For shots featuring the sun, Sebaldt worked with the VAD and gaffer Sean Rooney to simulate the sun's intensity by removing four LED-wall panels from the array 20' from the bottom of the LED wall, through which they shined a remote-controlled Cineo R15 LED spotlight. Rooney explains, "To fill in the gaps around the R15 lens, our key grip, Wil Parrott, cut a hole in a frame of Opal diffusion and put that up against the volume portal to allow the 'sun' to shine through. I backlit that with PAR cans to get it as bright as possible, so it would blow out on camera and blend with the R15 lens. To help blend that sun portal into the volume, we applied a bright, diffused oval mask on the volume image in a warm-white hue and played with the luminance and transparency until the blend looked realistic. We linked our lighting console with the volume, so it all functioned with the lighting controls."

The Roof

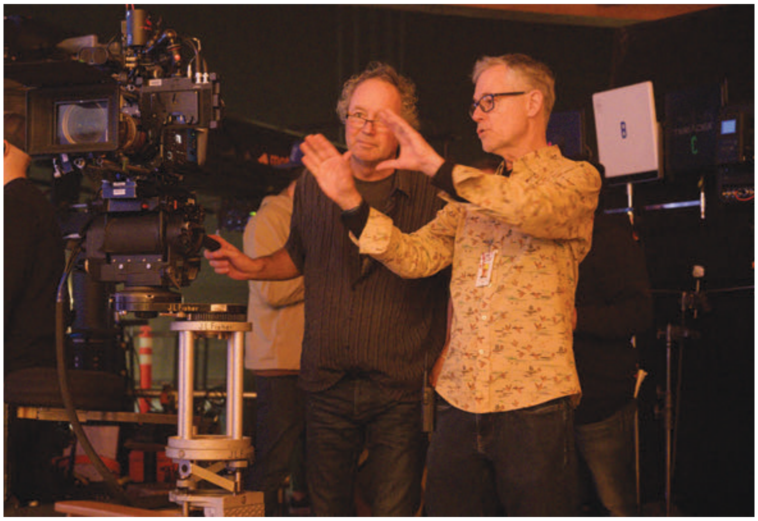
For scenes on the rooftop where Paul proposes to Iris, the production built a smaller set in an LED volume at Versatile Media Stage in South

Burnaby, rather than attempting to dismantle the restaurant-interior set at Bridge Studios. At this smaller, existing volume, they mounted the set on wheels against the LED wall. Pixomondo delivered its Unreal Engine assets to Versatile, whose artists matched the look Sebaldt had established at Bridge Studios. (Versatile was also host to additional LED-wall-volume setups for vehicle interiors.)

Horror kicks in when a penny, flung from the Sky View roof, gets sucked into an air vent, causing a spark that triggers an inferno. Pixomondo generated the penny as a macro-detailed, animated model. To create a sense of dread as Iris experiences a dizzy spell, Pixomondo generated a disorienting high angle of the rooftop — craning up, zooming out and trucking in — in a Hitchcockian virtual-camera move. "The directors wanted the viewers to participate in Iris' disorientation," says Rahhali. "We rotoscoped all the live-action people off the practical set, and digitally re-created the tower and the background to make a seamless shot. Shooting the scene on the volume, however, gave us wonderful lighting on our live-action elements, which worked really well with the CG tower and city. We then broke reality and took some creative liberties to enhance the feeling of vertigo. We modified the [3D camera tracking] on the CG cityscape and added subtle warping in compositing to make the effect more unsettling."

The Blast

To create fire blasting through the restaurant, special-effects coordinator Tony Lazarowich and his team staged pyrotechnics in the volume. For safety, construction built the Sky View set dressings out of concrete and other fireproof materials that SPFX plumbed with gas lines. The team then conducted closed-set tests of progressive burns of fire-protective coatings, air purity and particle emissions. "Tony's gas lines went into the floor, and he could hook into them wherever we needed flames for our cameras," Sebaldt says. "There was an elevated control position where special-effects crew could see into the set. That had multiple



Sebaldt eyes a frame with B-camera operator John Davidson.

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Above: Stefani Reyes (Kaitlyn Santa Juana) arrives at a remote cabin in the wilderness where her grandmother is hiding. Right: Sebaldt lit this scene with subtle, moody lighting to underscore the mystery of recurring *Final Destination* character William Bludworth, played by Tony Todd shortly before the actor's passing. "He came to it with such joy," says director Zach Lipovsky.

levers that looked like controls of a 1950s spaceship. They could open and shut the valves, and if there was an emergency, they could shut everything off in a second."

Stunt coordinator Simon Burnett worked with fire-stunt technicians Colin Decker and Dustin Brooks on the action, which Sebaldt covered with three cameras. The first take, which featured a live burn on stunt performer Yvette Ferguson, was a learning experience. "I overexposed the shot," Sebaldt says. "I was exposing for the world, as we had in dialogue sequences. When we got to the burning woman running through set, the flames burned out white. I've shot people in flames before, but I was quite surprised at the magnitude of fire on our stuntwoman."

To address the problem, he continues, "I went from T2.8 to a 5.6, and we brought up the brightness of the LED world outside, which accommodated the brightness of the fire. After that, all our shots featuring more and bigger flames were exposed correctly. We repaired the first shot in post."

The filmmakers enhanced the terror of the immolation by shooting at higher speeds, pushing against accepted wisdom of the volume's technical parameters. Sebaldt recalls, "During my prep, in 2023, multiple sources advised that one shouldn't shoot high-speed on a volume because it creates too many artifacts. For the scene with the burning woman running past camera, we shot at 48 fps with the volume playback set to the same speed. When we tracked the camera back with her, we froze the volume playback with a still-frame sky and shot at 96 fps."

There were occasional calls for bluescreen in the Sky View interior set. "If we ever framed a shot tilting down or looking off the volume, we added traditional bluescreen backings," says Rahhali. "If we had shots looking directly at the [wall when the displayed imagery was in focus], Christian shot a hero pass for interactive lighting, and then we'd switch to a blue LED card around the actor and shoot another pass [for digital compositing in post]."

To create the sensation of the restaurant tipping due to structural

The directors "mentioned early on that they wanted to have contrast within shots. That meant adding something bright deep in the background, like a lamp, window or a door that allowed light in."

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failure, the filmmakers used in-camera tricks in combination with a perspective shift on the LED array. "We Dutched the camera to make the set appear to move," Sebaldt says. "Nordin shifted the world outside, tilting it up a little bit."

Scenes of characters tumbling across the restaurant featured a section of the Sky View floor built on a 30-degree tilt with surrounding bluescreen.

The nightmarish climax, wherein Iris' engagement ring snags on exposed rebar and dangles her over the abyss — also shot with the aid of bluescreen — incorporated prosthetics by makeup-effects designer Todd Masters and his MastersFX team. "The effect of her ring finger ripping, with her flesh de-gloving from her hand, was 100-percent in-camera," notes Rahhali. "We added the background below, but otherwise that was all Todd Masters' work. It was so disturbing!"

"Death by Insert"

Subsequent deaths depicted in the film — all linked to survivors of the Sky View disaster — involve impalements, mutilations and eviscerations. "Our rule of thumb, to some degree, was to copy Guillermo del Toro," Lipovsky says. "We wanted to see how far we could go practically and then enhance the magic tricks with visual effects. For all of our body kills, we created proxy objects filled with guts and blood, shot those, and then visual effects added to that."

The filmmakers ratcheted up suspense at a barbecue scene using a cascade of innocuous props that topple, smash, bump and culminate in a lawnmower fatality. "We called it 'Death by Insert,'" Stein says. "It was all about shards of glass or little things that appear harmless, but will get you in this Rube Goldberg world. And because this story was about a family, we wanted to explore deaths that could happen in a residential setting, finding the suburban horror."

The production assigned macrophotography to 2nd-unit cinematographer Stirling Bancroft, CSC. "Stirling recommended the Laowa lens, a periscope with a very small 24mm lens that allowed him to place objects up against the glass," Sebaldt says. "It's a T8 lens, so everything was in focus; it creates a weird closeness that pulls viewers into the action."

For a bizarre accident with a garbage truck that leads to another fatality, MastersFX supplied a prosthetic likeness of the victim (played by Anna Lore). The production rebuilt the truck hopper interior, which

PHOTO BY ERIC MILNER.

Regarding the work of makeup-effects designer Todd Masters for this scene, VFX supervisor Nordin Rahhali says, "The effect of her ring finger ripping, with her flesh de-gloving from her hand, was 100-percent in-camera … It was so disturbing!"

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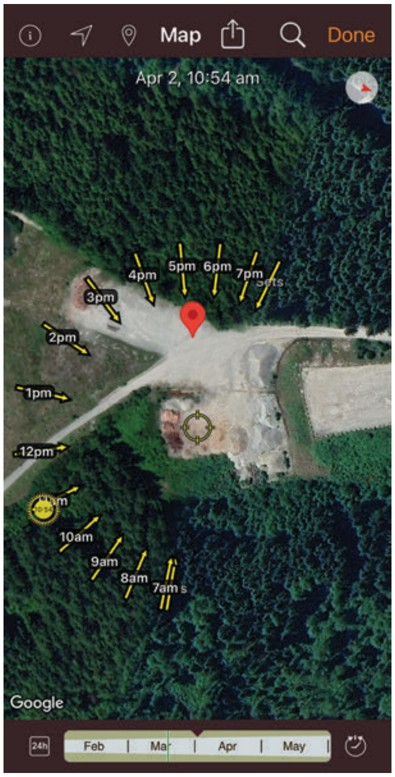
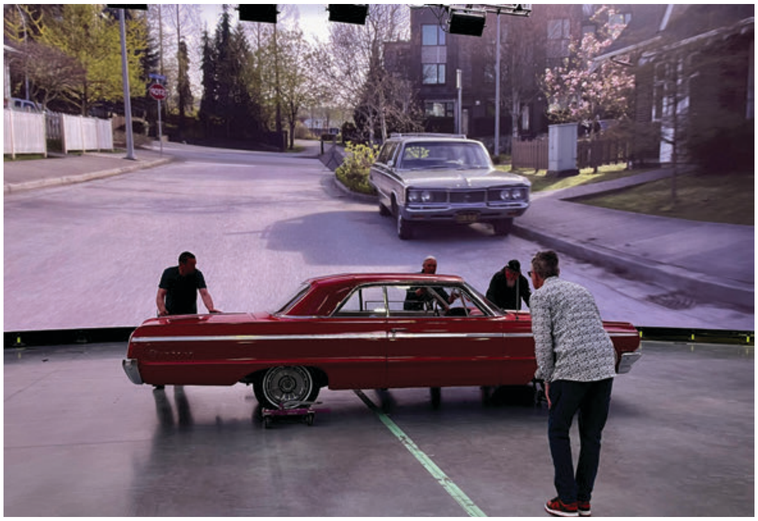
Above: Sebaldt confers with directors (from far left) Adam B. Stein and Zach Lipovsky, as A-camera operator Dean Heselden (wearing Steadicam vest) and Davidson observe. Right: For a location shoot featuring an ill-fated cabin, Sebaldt used ozPDA's Sun Seeker app, with the aid of a still from Google Maps, to determine proper shooting times for day exteriors. He notes that he would send sun-position images to the directors and the AD. Below: Versatile Media Stage provided the LED-wall volume for a number of vehicle interiors and the Sky View rooftop.





Sebaldt covered with a Venice 2 on a telescopic crane above the set, a Venice 2 handheld in the hopper, and a top-mounted, plastic-sheathed Blackmagic Cinema Camera 6K Pro. Juana performed atop the set against bluescreen, pulling back a severed limb. Visual effects bisected the victim's face. "It was a slow death, and they only had one take on the puppet," says Rahhali. "We ended up re-creating the head slice in CG. That ended up as one of our most challenging VFX shots. It was a fine line between comical and gruesome, and if we leaned too heavily either way, it fell apart."

Another deadly mishap involves two family members who inadvertently trigger a hospital MRI machine that kills both by magnetic attraction. MastersFX supplied prosthetics that worked with an in-camera SPFX rig that appeared to pull one victim (played by Richard Harmon) belly-first into the scanner. Lipovsky explains, "They built a double-decker MRI machine, and Richard lay on the top deck on his back, with his top half coming out. A stuntperson lay face-down on the bottom. As Richard went in through the hole, he leaned back and the legs-performer kicked, so it looked like he was folding backwards."

Inside the scanner, magnetism causes a rain of metal objects to tear through the victim's tattooed torso. The shot featured VFX derived from a prosthetic. "Todd Masters designed the tattoo and a puppet piece," says Rahhali. "We ended up using that as reference for objects going through the skin. We then rebuilt the MRI and the exploding belly in CG and composited the hospital behind."

The hospital morgue serves as a setting for a haunting cameo by franchise favorite William Bludworth (Tony Todd), whom Stefani consults for his insights into her predicament. Sebaldt lit the morgue set with subtle, moody lighting to underscore Bludworth's enigmatic presence. "Tony was quite sick," notes Lipovsky. "It was clear that this was likely going to be his last *Final Destination* movie, and potentially his last role. But he came to it with such joy. He was so excited to be doing what he loved. Bludworth has been a mysterious character in the past, and now he was able to be more transparent about his beliefs about mortality and life. The take that's in the movie is Tony speaking from the heart, saying, 'You never know when ...,' and it brought the house down."

Explosive Finale

The finale unfolds at a heavily fortified cabin that's destroyed in a gas explosion. The production built the cabin in the Greater Vancouver Regional District, on a former logging road besieged by wind, rain, mud and curious bears.

For night exteriors, Sebaldt and gaffer Rooney illuminated the cabin and surrounding forest using a 130'-tall Starlite crane with six remote-controlled 18K HMIs, four 120' boom lifts bearing pairs of 18K HMIs, and two 80' boom lifts rigged with balloon lights for ambient fill.

"The balloons were 8-by-24-foot tubes in pipe cages to stabilize them against windy conditions," Rooney says. "Each balloon contained two 575-watt HMIs and two 1,200-watt HMIs to give us maximum flexibility. The balloons also provided work lighting for the crew at night in the very muddy and rugged terrain. Using all those tools, we were able to light setups very quickly and cover a lot of area."

SPFX coordinator Lazarowich's team rigged the cabin explosion, which Sebaldt covered with eight cameras: three Venice 2s shooting at 96 fps at 5.5K, and five additional cameras in crash housings shooting 48 fps, comprising one Blackmagic Ursa Mini Pro 12K, two Cinema Camera 6K Pros and two Sony Alpha FX3s.

Lazarowich provided a 15'-tall flame that Sebaldt used to set

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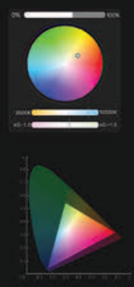
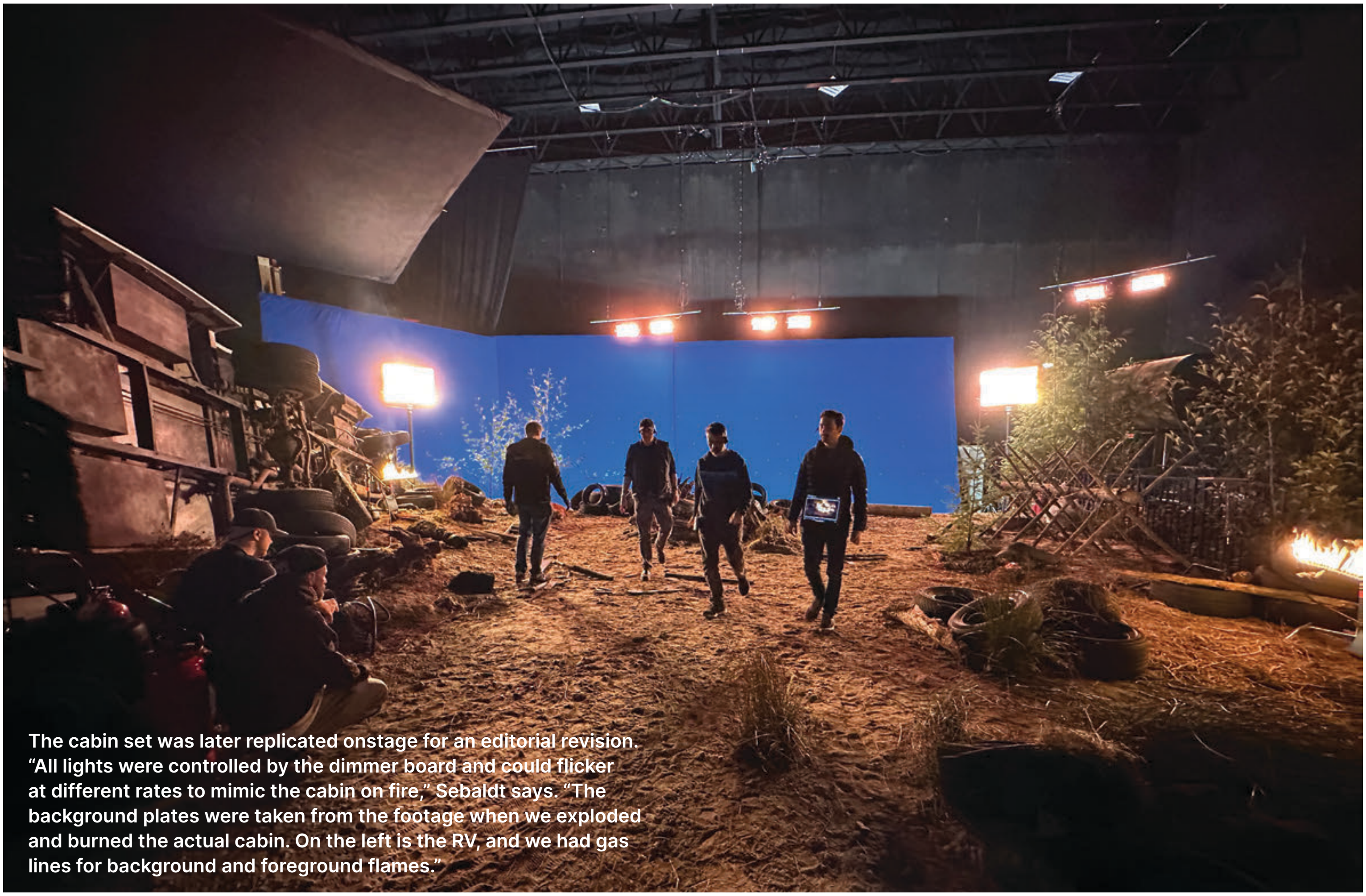


Tech Specs 2.39:1, 1.90:1

Cameras | Sony Venice 2, Alpha FX3; Blackmagic Design Cinema Camera 6K Pro, Ursa Mini Pro 12K

Lenses | Leitz Prime, Laowa Macro Pro2be, Angénieux Optimo Ultra, P+S Technik Skater Scope, Arri/Zeiss Ultra Prime 8R



The cabin set was later replicated onstage for an editorial revision. "All lights were controlled by the dimmer board and could flicker at different rates to mimic the cabin on fire," Sebaldt says. "The background plates were taken from the footage when we exploded and burned the actual cabin. On the left is the RV, and we had gas lines for background and foreground flames."

"Whether we were creating a scare or feelings of suspense, romance or tenderness, we achieved that visually by first coming at it emotionally. With Christian, it's always story first."

exposures. To balance the intense, sudden contrast of the blaze, Rooney and his team added his full complement of 14 18Ks to boost ambient lighting. The massive blast required no VFX enhancement.

For an editorial revision that added Stefani's mother, Darlene (Rya Kihlstedt), to the cabin sequence, the production built a 50'x50' portion of the set on stage with interactive firelight. "We surgically shot the actors around Darlene's RV," Rahhali says. "The way that Christian lit that, with a little bit of smoke going off to black, made those scenes drop in easily with a bit of fire and vignetting in post."

The film's coda brings Stefani's nightmare to a close with a reprise of the same "bad penny" that ends up rolling down a hillside to jam a switch in a train track. Pixomondo animated the coin to a background plate that A-camera operator Dean Heselden captured on location. "Dean used an Arri Trinity," Sebaldt says. "It makes the camera float out on an arm, so he could crane the camera down very low. He ran down the zigzagging terrain, which gave us our background, and then Nordin added the penny jumping and rolling."

Volume Views

Sebaldt's first job on a large-scale LED-wall volume marked a new chapter in his visual-effects journey, which began with an apprenticeship at Bavaria Studios in Munich under Jack Cardiff, BSC. "As part of my two-year training, I spent a few months in the special-effects department doing greenscreens, front-projection and so on, and it was fascinating for me," the cinematographer recalls. "Volume work is complex, with a huge image that needs to pre-process at super-high resolution. For the Sky View scenes, it took a while to dial in colors and contrast to make it feel real, like the characters were experiencing a wonderful evening in this amazing place. It had to feel romantic, so colors in the sky were a little enhanced with purples and violets as the sun was going down. In the final edit, those looked different from shot to shot, so we did adjustments in post. But it is an amazing tool. Without the volume, we could not have made this feel believable."

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Setting a Trap for *Locked*

Cinematographer Michael Dallatorre turns to an array of custom glass to help tell a story set inside a deadly bespoke vehicle.

By Matt Mulcahey

Desperate for money to repair his delivery van, petty thief Eddie (Bill Skarsgård) slips into an unlocked luxury SUV, hoping to swipe something he can turn into quick cash. Slipping back out isn't so easy: After repeated break-ins, the vehicle's owner, William (Anthony Hopkins), has set a remote-controlled trap for the next would-be criminal, and Eddie is caught.

Directed by David Yarovesky and shot by Michael Dallatorre, *Locked* reimagines Mariano Cohn's Argentinian thriller *4x4* (2019). Dallatorre, who was named an *AC* Rising Star of Cinematography in 2020, says that upon reading the script, "the first thought I had was, 'How do we keep this guy being stuck in a car interesting?'" The filmmakers' strategy ultimately included custom lenses, a modular SUV cut into eight removable pieces and a three-minute tracking shot that repeatedly circles the interior of Eddie's "prison" as his torment continues.

Longtime Creative Partners

Dallatorre has been collaborating with Yarovesky since 2006, when they teamed on a music video. "It was a difficult shoot, but one of those jobs where you bond after a rough time," the cinematographer recalls. "We've been friends since then, and I've shot almost everything he's done." Those projects include more than 100 music videos and short films, as well as the horror movie *Brightburn* (2019).

On *Locked*, which was shot over 19 days in Vancouver, Dallatorre also continued a collaboration he has enjoyed even longer — with Panavision. He began working for the rental house in the shipping department while studying at Los Angeles City College, and by the time he ended his 18-year run at the company, he was running its New Filmmaker Program.

Early in his tenure, he found a kindred spirit in Dan Sasaki, who is now Panavision's senior vice-president of optical engineering and lens strategy and an ASC associate member. "Being the nerdy techie guy that I am, and Dan being the nerdy techie guy that he is, we bonded," says Dallatorre. "I learned a lot at Panavision, including that you can give 10 filmmakers the same lens and camera setup and you're going to get 10 different looks."

The setup on *Locked* included an Arri Alexa 35 and a 2.76:1 aspect ratio. Dallatorre captured in Open Gate mode at 4608x3164, which, coupled with a 2x anamorphic squeeze, resulted in a 2.90 image that was then cropped to the same ratio as Ultra Panavision 70.

Dallatorre explains the approach: "Dave and I did a series of music videos for Steve Aoki, which we shot 3.55. Dave was like, 'They're never going to let us do that [on *Locked*], but what's the widest we can do?' I said, 'How about Ultra Panavision? That [has a precedent] for theatrical distribution."

The cinematographer also employed a Freefly Ember S5K on a DJI Ronin 2 gimbal for a car-crash scene that called for a high-speed camera to spin as the Dolus rolls down a hill. A Phantom was too big to fit in the vehicle, so Dallatorre turned to the Ember, shooting 600 fps at 5K resolution.

He went lo-fi for the Dolus' six security cameras, which allow William to keep tabs on his captive. "Dave and I love doing stuff for real. When we did the music video 'Guardians Inferno,' which was [styled after] 1970s music videos, we found some old Ikegami tube cameras from the '70s to use. For the security cameras on *Locked*, I went online and bought 10 different versions of car back-up rear-view cameras."

Company 3's Chad Band served as dailies colorist, with Picture Shop colorist and ASC associate member Mitch Paulson handling the final grade. "I like having one show LUT and then having a colorist sitting at their desk comfortably sipping coffee and making things look good for the dailies," says Dallatorre. "Then, when I'm back in my room, I'll take a look at everything on Frame.io on my iPad, and I'll watch them again on the hotel TV."

Custom Optics

For his main lenses, Dallatorre chose Panavision's T Series anamorphics, with which he was very well acquainted. "When we were designing the T Series, Mike was instrumental in vetting them," Sasaki reports. "He'd shoot tests with them and say, 'This works, but I don't like this,' or, 'This doesn't look like a Panavision lens.' If I'd go too far or step out of bounds, he'd tell me."

Dallatorre's package also included a Primo 48mm-550mm T4.5 anamorphic zoom, but *Locked* presented some problems that no off-the-shelf lens could solve. For those situations, Dallatorre turned to Sasaki for new custom glass — as well as a couple of hand-me-downs from Christopher Nolan and Hoyte van Hoytema, ASC, FSF, NSC.

"The first thing I told Dan was, 'When the camera is in the car, I don't want to have to be on some crazy 14mm in the corner,'" Dallatorre recalls. Sasaki's solution was to create a 30mm T2.3 anamorphic with a minimum focus of just 15", which Dallatorre estimates he "probably shot half the movie on." The cinematographer dubbed it the "Brute Force" anamorphic, based on Sasaki's description of how he achieved its snug close focus.

"Traditionally, if you put an anamorphic lens that close to someone, it would distort and make them look round," Sasaki explains. "Mike asked for a 30mm that could focus that close without distortion, and we ended up building a brand-new concept lens for him. It made me think outside of my normal path, which is where 'brute force' came from. We'd build a model in the computer that looked like it would work, but then we'd get the prototype onto the bench and realize we still had to force it further. Through that process, we discovered new methods that can be applied to future products."

The lens arrived a week before principal photography began, and it was adorned with tape on the barrel for the focus and iris rings and a sticker of Sasaki's dog Otis. "We got the proof of concept really quickly, but the thing about making a new lens is all the minutiae at the end," Sasaki continues. "We got the 15-inch close focus without distortion, but then it was an iterative process to bring it all together in a real product that could be used on set. As for the sticker, Mike loves dogs. Because the lens was a prototype, we didn't have a product or series name to put on it, but we had that sticker. So, we put it on the lens for Mike."

To satisfy Dallatorre's request for an extreme wide-angle lens with minimal distortion, Sasaki created an 8mm spherical rectilinear lens that was used for *Locked*'s early pre-entrapment scenes and the car-stunt work once William begins to remotely drive the Dolus. (The stunt work was handled by 2nd-unit director Ryan Ennis and 2nd-unit cinematographer Chris Wiseman.) Anyone hoping to use the lens in the future is out of luck, however. "That was a one-off lens we built using components from an H Series lens," says Sasaki. "We had to return the components to the H Series, so it's since been dismantled."

For shots of Skarsgård attempting to trip the vehicle's kill switch with

This page and opposite: Small-time thief Eddie (Bill Skarsgård) is trapped inside of the heavily modified luxury SUV he attempts to rob.

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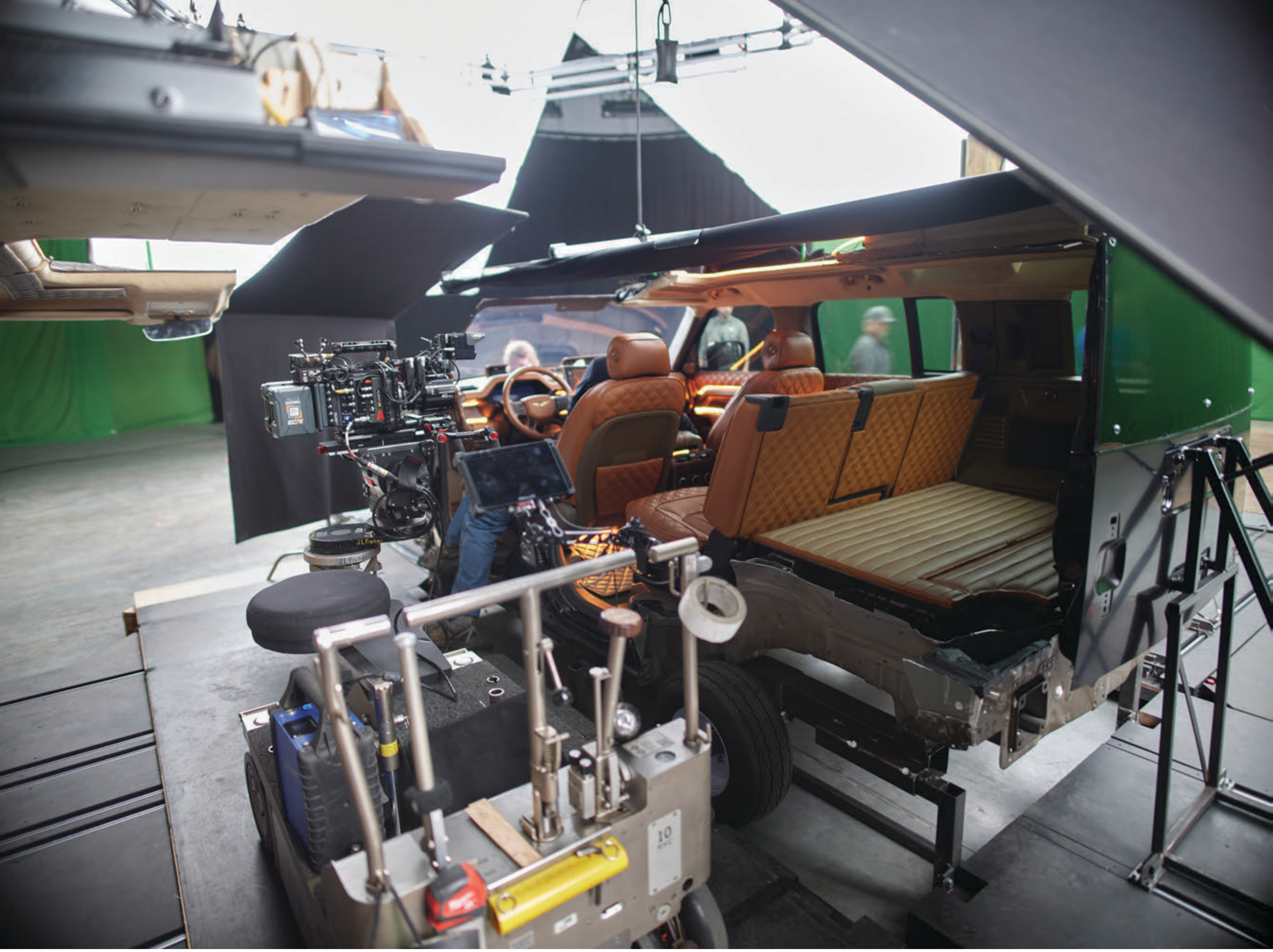
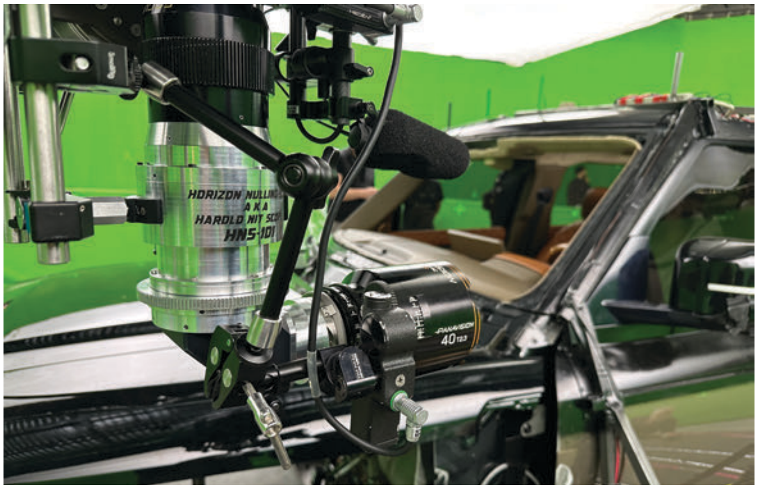




Top: The modular "Transformer Car," created by production designer Grant Armstrong, broke down into eight sections attached to rails that the crew could slide in and out of position. Above: A Horizontal Nulling Scope, also known as a Harold Scope, helped execute horizontal pans, as well as the film's signature oner.

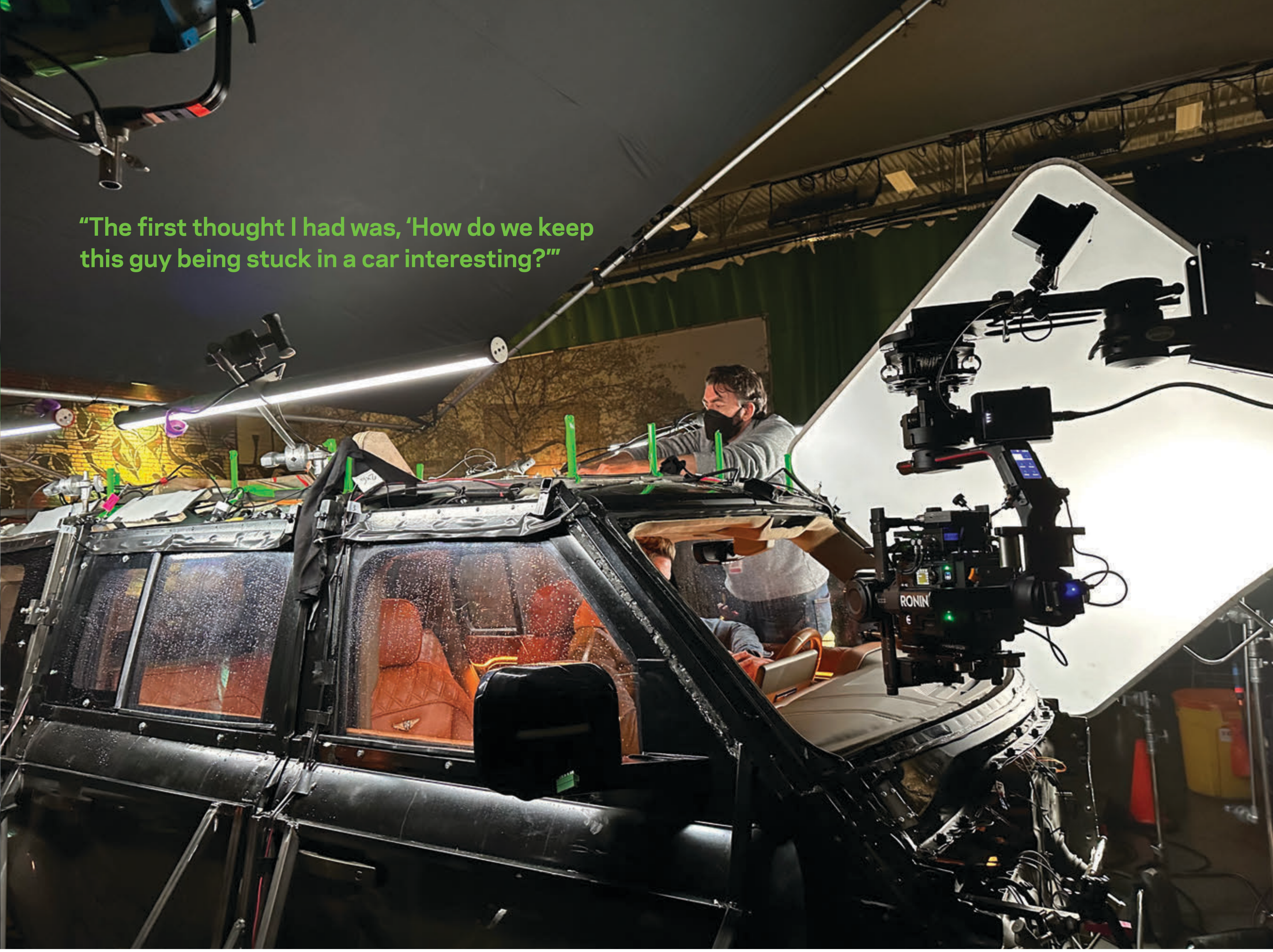
his toe to avoid William's security cameras, Sasaki repurposed the probe lens built for *Oppenheimer* (*AC* Oct. '23).

Rounding out the custom glass were two periscope lens attachments, a new creation called the Horizontal Nulling Scope (aka Harold Scope) that sits at a right angle and can rotate 360 degrees, and the *Dunkirk* Scope, named for the production it originated on (*AC* July '17). "When Hoyte was prepping *Dunkirk*, we made that for a shot of a plane flying overhead," Sasaki says of the lens, which took Sphero 65 glass. "Where the Harold Scope was used for shots that pan horizontally, the [*Dunkirk* Scope] tilts up and over vertically."

Achieving the Oner

The Harold Scope was key to making the signature oner in *Locked* possible. In the three-minute single take when Eddie first enters the Dolus, the camera circles inside the vehicle five times as he searches for something worth stealing. Then, as the circles get tighter, Skarsgård tries to exit the vehicle with increasing desperation. Dallatorre describes the shot as Eddie "going down the rabbit hole."

Also key to pulling off the oner was a modular vehicle design suggested by production designer Grant Armstrong that was inspired



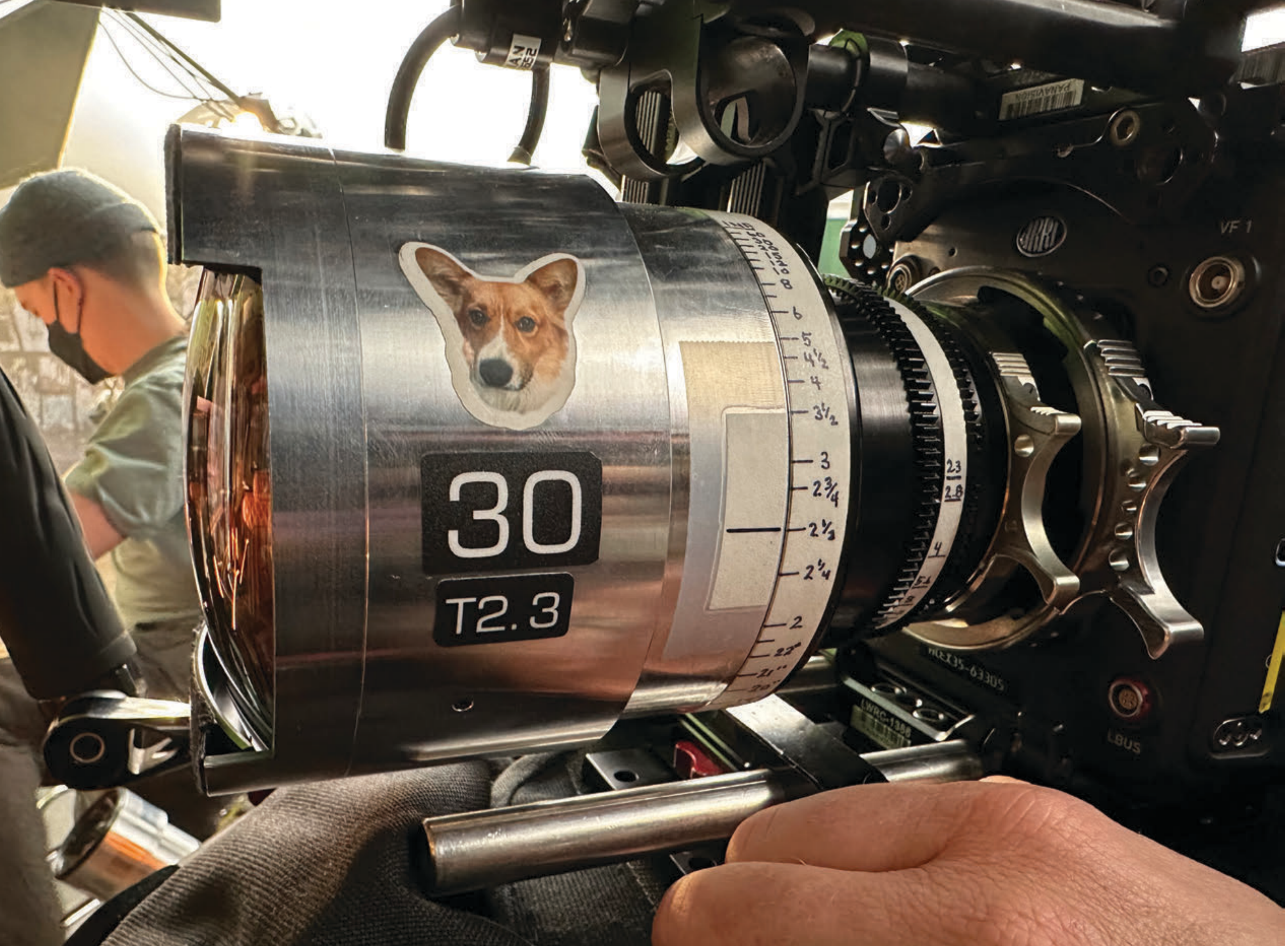
"The first thought I had was, 'How do we keep this guy being stuck in a car interesting?'"

by his work on Alfonso Cuarón's *Gravity*, shot by Emmanuel Lubezki, ASC, AMC (*AC* Nov. '13). "The capsule set on *Gravity* had three walls that pulled out on tracks to allow the actors access and for the camera positions," explains Armstrong. "It was a quick and easy process that saved a great deal of time. Every time I've worked in vehicle sets, it has always taken so much time dismantling and reconstructing the vehicles that I thought it would be useful [on *Locked*] to build the set on tracks, making the car completely accessible from any angle. I proposed the idea to Dave Yarovesky, having no idea if it would actually work."

The team created three versions of the Dolus using modified Land Rover Defenders: a stunt version for exteriors, a fully functional hero car, and Armstrong's modular version, which Dallatorre dubbed the "Transformer Car." Armstrong notes, "Most car manufacturers spend at least two years designing and building a prototype vehicle, and in true film-business style, we had just eight weeks to produce our three vehicles!"

The Transformer Car broke down into eight sections attached to rails that could be slid in and out of position. "A small set-construction team under the leadership of construction coordinator Glenn 'Woody' Woodruff completely dismantled the [Land Rover] and took it down to its

Top: An Arri Alexa 35, rigged to a DJI Ronin 2 gimbal, helps capture a scene in which Eddie first starts up the car. Above: Cinematographer Michael Dallatorre, director David Yarovesky and A-camera operator Dean Heselden on set.



Above: Dallatorre estimates that the 30mm T2.3 anamorphic lens custom-built for the production was used to shoot about half the movie. Right: A 24mm probe lens was used for a forced-perspective shot of Eddie's foot in the foreground and his face in the background.

absolute shell," says Armstrong. "That took far longer than I ever imagined. There's so much that goes into a modern SUV, and we needed it to be as light and as versatile as possible."

There was an additional challenge: "[The pieces of the set] had to lock into place so our lead actor could take his full frustrations out on the vehicle itself," Armstrong explains. "We wanted to avoid any movement when windows were hit or doors kicked; it had to be solid. We replaced the windows with Lexan shatterproof polycarbonate and reinforced the doors with a steel-plate exterior."

Work on the Transformer Car was still underway when principal photography began, so the first week was spent on exteriors — mainly location work in the East Hastings Street section of downtown Vancouver. That included the practical parking lot where Eddie spends the first half of the film locked in the parked Dolus.

When Dallatorre arrived on set during the second week to shoot the oner, he had yet to do a full rehearsal with the modular vehicle. However, he had prepped by shooting iPhone tests in a different vehicle with Yarovesky and Skarsgård to work out the timing and create his own animated previs. "I learned Unreal Engine because the producers were like, 'We're not exactly sure what you want to do with this shot,' and it was an expensive build. [I spent] hours and hours watching tutorials by some 13-year-old on YouTube!"

The filmmakers placed the Alexa 35 — paired with a 40mm T Series

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Top: The crew sets the lighting on location in Vancouver. Above: Heselden operates camera for a shot that reveals the car is soundproof and blacked out; this was achieved with the aid of a bespoke periscope lens attachment nicknamed the *Dunkirk* Scope, which was first designed for Christopher Nolan's 2017 war thriller by Panavision's Dan Sasaki, an ASC associate member.

prime — on a Libra head, which was rigged to a 38' Scorpio telescopic crane. The camera faced straight down, making the 90-degree angle of the attached Harold Scope parallel to the floor. As the camera circled inside the Dolus, the vehicle's sections were repeatedly slid out and then pushed back into place. Dallatorre estimates the final tally of takes at 17, noting that achieving the move required crane pickle operator David Kershaw, dolly grip Jack Cruikshank and A-camera operator Dean Heselden to work in perfect unison. Puppeteering the removable doors called for all hands on deck, with Armstrong, art director Jaclyn Kenney, the on-set painter and the construction team donning green Lycra jumpsuits and doing their part. "It was pretty stressful knowing the timing was crucial to the success of the shot," Armstrong says.

Orchestrating the lighting was also intricate, as units had to be dimmed up and down to preserve continuity as pieces of the vehicle moved. Four soft boxes that each held eight Arri SkyPanel S60s were placed on chain motors above the vehicle. The LED ribbon built into the Dolus' doors and sunroof also had to be adjusted. "It was a matter of timing the dimming as each piece of the vehicle opened up," says gaffer Sean Rooney. "We needed whatever soft box was behind camera to be out to avoid camera shadow. Same with all the RGBWW LED ribbon built into the SUV. I also had [an Astera] Helios LED tube in my hand and followed closely next to camera. It was quite the spectacle, with the ballet of people in green tights pushing and pulling the sections of the SUV in and out as the camera passed!"

Parking-Lot Peril

Whereas the oner was shot with greenscreen backdrops, the rest of the parking-lot scenes captured onstage employed printed backings with

Tech Specs: 2.76:1
Cameras | Arri Alexa 35, Freefly Ember S5K
Lenses | Panavision T Series, Primo, Custom

The SUV's owner, William (Anthony Hopkins), peers inside with sinister glee.

plates photographed on an iPhone. The sets were constructed in an airplane hangar at Fort Langley, just outside of Vancouver. The cavernous space allowed the parking lot to be re-created nearly to scale, even down to background vehicles transported from the practical location.

"We created the lot's rear graffiti wall in full scale to the exact position it was in the car park using the same vehicles," Armstrong says. "The other three views were created to smaller scale so they could be closer to the main set but still use cars as a midground element. It worked incredibly well and cut down the number of VFX shots to a bare minimum."

Because the parking-lot exteriors were shot first, Dallatorre metered and took meticulous exposure and color notes in order to re-create the lighting conditions onstage. "Our four overhead soft boxes with SkyPanels were simply dialed into the levels and colors to match whatever the location work had established," says Rooney. "We also added SkyPanels through diffusion frames on the floor for additional edges or as fill, if needed — and a 5K Fresnel through diffusion when we needed to match a more distinctly sunny look."

The Transformer Car was used on the main set, but the fully functional Dolus was placed nearby in the hangar for B-camera operator Matthew Tichenor to grab inserts of its dashboard display, which fluctuates with William's voice when he calls into the car's speaker system. Once William goes from disembodied voice to physical presence, the stage was again shrouded in greenscreen for poor-man's-process work.

"Early on, we'd conceptualized using Kino Flo Mimiks for our poor-man's-process rig onstage, but they had just been released and needed to be shipped from L.A., which we couldn't afford," says Rooney. "So, we had to find another solution." The answer was encircling the Dolus in pipe rigs on rope pullies and hanging groups of Astera Titan tubes from the pipes. Rooney explains, "From the lighting console, we ran the tubes in four cells — each tube had four individually controlled zones. This allowed us to get nice, smooth chase patterns across many sets of tubes to simulate movement. Inside the vehicle on location and onstage, I would add the occasional Astera Helios tube, but my go-to fixtures were the little Aputure MC Pros. I could easily hide them on the dash or even magnetically stick them to the inside of the doors and run them wirelessly to the lighting console."

Unlocked Potential

Dallatorre asserts that the production's unconventional approach and budgetary constraints could only have been navigated by a team uniquely suited for the challenges they posed. "I was fortunate to have an exceptional crew, the unwavering trust of Dave, the solid support of producers Ara [Keshishian] and Zainab [Azizi], and the love from my Panavision family — all of which made this film possible," he says. "The joy that comes from imagining an extraordinary idea and witnessing individuals enthusiastically endorse your vision is what makes the hard work and sacrifices worthwhile."

Clubhouse News
Society Welcomes New Members

Sophie Darlington, ASC
During her formative years, the Ireland native was deeply moved by *Born Free* — the 1966 film inspired by the lives of British conservationists George and Joy Adamson as they raised an orphaned lioness named Elsa. At 19, she moved to Tanzania to chase her dream of wildlife filmmaking, but struggled to break into a field that seemed closed to her. Arriving in East Africa in her early 20s, she met Emmy-winning cinematographer Hugo van Lawick, who was renowned for his long-term partnership with National Geographic and Jane Goodall; van Lawick took Darlington on as an apprentice in the 1990s, and she spent several years learning the craft of natural history filmmaking out on the Serengeti Plains.

She is known for her ability to capture emotional behavioral content with a strong focus on beauty. Her cinematography credits include National Geographic's 2024 series *Queens*, which focused on female leadership in the natural world, and feature films for Disney Nature and BBC Earth, as well as landmark series for, among others, Netflix, National Geographic and the BBC, including *Dynasties I* and *II*, *Our Planet I* and *II*, *The Hunt, Planet Earth II* and *Life Story* — all narrated by the legendary David Attenborough.

Catherine Goldschmidt, ASC, BSC
Goldschmidt was born in Berkeley, Calif. and grew up in suburban New Jersey. Although she was raised without television, her parents were movie lovers and would often take her to the cinema. In high school, she worked at her local video store, and at Wesleyan University, she worked as a projectionist in the student-run cinema, projecting 35mm and 16mm film prints. It was at Wesleyan where she first caught the filmmaking bug, and after graduating with a BA in Film Studies, she moved to Los Angeles to pursue a career in cinematography.

She applied and was accepted to the MFA Cinematography program at the American Film Institute Conservatory, which she attended from 2007-'09; her professors included ASC members Stephen Lighthill, Amy Vincent, Robert Primes and Bill Dill. Upon graduation, she was hand-picked by Alan Caso, ASC to be his mentee in the Academy of Television Arts and Sciences Internship Program.

Goldschmidt's feature credits include director Morgan Neville's Academy Award-winning documentary *20 Feet From Stardom*, *No Light and No Land Anywhere*, *Cover Versions* and *The Honor List*. Her credits in television include the opening block of Season 12 of *Doctor Who*, *Dummy*, *A Discovery of Witches* and the opening block of the original miniseries *Chloe*. Her work on the *House of the Dragon* episode "The Lord of the Tides" garnered her ASC and Emmy award nominations. Her latest work on the series *Renegade Nell,* as well as her work on Season 2 of *House of the Dragon*, was released last year. She also recently served as a cinematographer on Season 2 of *The Last of Us*.

She was named an *American Cinematographer* Rising Star of Cinematography in 2022, and became a member of the British Society of Cinematographers in 2023.

Tari Segal, ASC
Born in Chicago, Segal was immersed in the city's jazz scene from an early age. Surrounded by great artists such as Dizzy Gillespie, who frequented her father Joe's legendary club, Jazz Showcase, she was drawn to the expressive, improvisational elements and style of the music, which have inspired her camerawork.

She studied at Columbia College Chicago, majoring in film with a concentration in cinematography. After graduation, she relocated to Los Angeles, where she secured a camera-department internship on the Oscar-winning drama *Sideways*, shot by Phedon Papamichael, ASC, GSC — who became her long-term mentor. She began her career soon after, working as a gaffer and camera operator while shooting numerous shorts, music videos, and then indie features and TV series. Along that path, another inspiration was Lisa Wiegand, ASC, with whom Segal worked on the series *Chicago Fire* and *Chicago Justice*.

Segal's credits include the miniseries *Interior Chinatown* and the upcoming feature *Bookends*. She recently wrapped Season 1 of crime drama *Long Bright River*.

PHOTOS BY DANYAEL MIGUEL.

ASC Hosts Ball State and SVA Students

The ASC Education & Outreach Committee — co-chaired by Society members **George Mooradian** and **Shana Hagan** — coordinated a March 4 gathering at the ASC Clubhouse for students from Ball State University and the School of Visual Arts.

Joining Mooradian and Hagan were ASC members **Adam Bricker**, **Christopher Chomyn**, **Patti Lee**, **Cybel Martin** and **Mandy Walker**, who brought a vast range of practical on-set experience to the discussion.

Organizing the delegation from Ball State was associate teaching professor in department of media Benjamin Strack; the SVA group was coordinated by Salvatore Petrosino, the college's director of special projects and events recruitment in its office of admissions.

The Education & Outreach Committee organizes in-person meetings at the Clubhouse and industry events throughout the year. For information about how your school can participate, contact Sal Maldonado or Sharon Bruneau at the ASC at (323) 969-4333.

Photo above, second row: ASC members Mandy Walker, Patti Lee, George Mooradian, Cybel Martin, Christopher Chomyn, Adam Bricker (seated from left to right) and Shana Hagan (standing at far right) join students of Ball State University and the School of Visual Arts for a gathering at the Society's Clubhouse organized by ASC Education & Outreach Committee co-chairs Mooradian and Hagan. Photo below, at left: Cinematographer Jannicke Mikkelsen, FNF delivers an address on shooting in space at the Clubhouse one week after returning from SpaceX mission Fram2.

At Clubhouse, Mikkelsen Talks Shooting in Space

Just one week after returning to Earth from a near-four-day human-spaceflight mission, cinematographer Jannicke Mikkelsen, FNF visited the ASC Clubhouse to share her experiences as a crewmember for the historic expedition. Sponsored by Red Digital Cinema, her presentation was delivered on April 11 to a captivated crowd of Society members, colleagues and friends, who laughed heartily when one of the event's organizers — **Suki Medenčević, ASC, ASBiH, SAS** — introduced himself as "the co-chair of the ASC Interstellar Committee, formerly known as the ASC International Committee."

Named Fram2 — in homage to the Norwegian polar-exploration ship *Fram* — the mission was operated by SpaceX with a Crew Dragon spacecraft, and was the first of its kind to explore Earth from a polar orbit. Mikkelsen served as vehicle commander, and was tasked with documenting the crew's activities, including their observation of atmospheric optical phenomena. Upon launch, her chief concerns were to deliver visual representations of waves in the upper-Earth atmosphere when flying over auroras en route to the North and South Poles, and to capture a range of moments that might entertain and inspire viewers. Her cameras of choice included the Red V-Raptor 8K VV and Canon EOS R5 C.

"I needed cameras that would both work with the same lens set," Mikkelsen said. "And I needed lenses that would sustain their quality, so [during testing], they were subjected to six Gs over 11 minutes and blasted with radiation, heat, cold and humidity. This was pretty much the same testing we went through as humans [to qualify for spaceflight]."

O2XR CTO Ron Martin and virtual-production supervisor Habib Zargarpour were also on hand to discuss the previs sessions conducted during their 14-month prep period.

Since returning home, "I started looking at Earth as an anthill," Mikkelsen said. "An ant doesn't know its purpose, but it's a very important part of our ecosystem. The ASC has always looked after me, and it's incredible to feel the warmth of the international artist community in support of what we're creating. As humankind, we don't always know where we're going. Yet, we are driven by our fascination with technology. I can't say what is the 'purpose of it all,' but I think we are on the right path."

Read our complete coverage of Mikkelsen's Fram2 talk here:

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ASC Members Field-Test the Alexa 265

By Jeff Berlin

ALEXA 265
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ARRI Rental 01825
BUD-1
FPS 24.000
SHUTTER 172.8
EI 800
WB 5600K +0.0
FILTER GLMR 1

Full and close-up left-side views of the Arri Alexa 265.

There's something magical and even intangible about the look and feel of larger-format cinematography. Polly Morgan, ASC, BSC observed that ethereal "it factor" when she photographed parts of *The Woman King* on the Arri Rental Alexa 65 "Classic," as some are now calling that camera, with director Gina Prince-Bythewood. The two are now shooting *Children of Blood and Bone* for Imax on the newly launched Alexa 265, the latest larger-format digital cinema camera from Arri, which has impressed her just as much with its imaging. Explaining why she selected the 265 for *Children*, Morgan says, "I loved the large-format nature of the footage and how we felt we were right there with the actors. It was a more immediate experience for me."

The 265 is designed to be smaller, lighter, faster, and more maneuverable than the Alexa 65. It features a revised version of the original Alexa 65 sensor with 6.5K photosite count, along with the company's new Reveal color science and LogC4 curve, first introduced with the Alexa 35.

David Zucker, product manager of the Alexa 265, worked closely with Andrew Prior, Arri Rental's head of technology and development, to bring the camera to fruition. Zucker maintains that the 65mm system does indeed produce a more immersive quality, and offers his technical interpretation of the format's qualities, noting that it "provides a striking sense of dimensionality and texture that doesn't just come from resolution, but rather from the physical scale of the sensor and its larger [photosite] size.

"I am particularly fond of the idea that with this 65mm format, one can capture lens characteristics that would be impossible to see with any smaller format," Zucker adds. "One of the most beautiful things about this camera [is] that you can see areas of lenses you've never seen before. There is distortion and beauty, both usable and unusable, but sometimes those unusable elements [can become] a blessing as well."

Greig Fraser, ASC, ACS who photographed *Rogue One: A Star Wars*

Story (*AC* Feb. '17), *Mary Magdalene* and *Dune: Part Two* (*AC* Nov. '24) on the Alexa 65, echoes Zucker's enthusiasm for these characteristics, citing them as one of the joys of larger-format cinematography. "I love it when I speak to lens designers and they tell me [a lens] is only designed for an image circle of 44mm, or it's only designed for this or that, but then, when I put [that lens] on a larger sensor that's got an image circle of 65mm, it feels like I'm uncovering a little bit of treasure that no one was supposed to see. I'm seeing it and I'm utilizing it for artistic purposes, [and] it feels quite good to be able to do that."

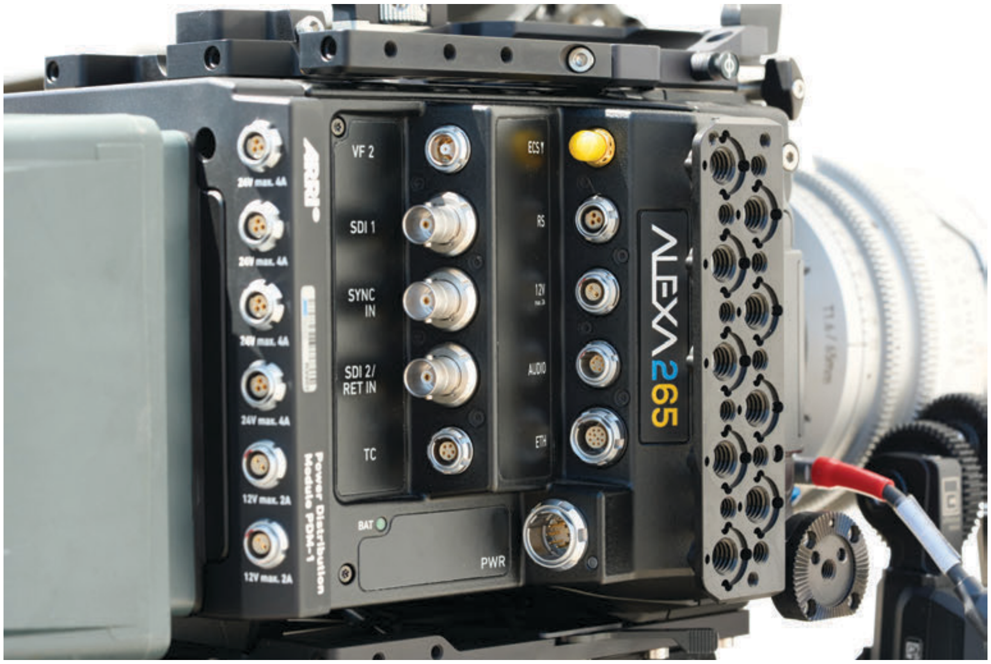
One notable characteristic of a large sensor like the Alexa 265's is the dynamic between field of view, focal length and how they relate to depth of field. Directors of photography who shoot on the Alexa 265 use longer lenses for wider shots, which means they can exploit shallower depths of field due to longer focal-length lenses delivering wider angles of view.

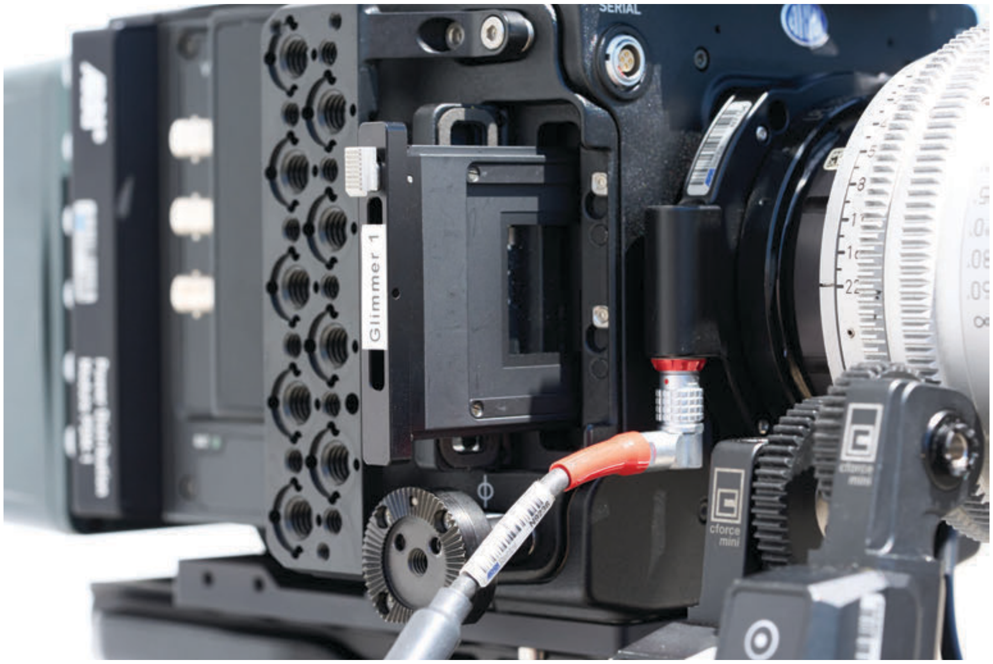
This is a major consideration for James Laxton, ASC as he photographs the next season of *Beef* for Netflix on the 265. "The field-of-view perspective versus the focal-length perspective is an interesting one," he says. "And that's why I tend to love this size sensor, because we're all used to seeing an actor's close-up on, let's say a 75mm, and there's a certain field of view we're used to seeing on a 75mm [paired with a Super 35 sensor] when we're thinking about coming in for close-ups. But put a 75mm lens on a 65mm sensor and you're going to get much more field of view, and with that, so much more performance, and you will see more physicality from an actor, within your frame."

Laxton's method takes specific advantage of the larger sensor size. Per conventional practices, some cinematographers might shoot a close-up of an actor at, say, 6' from the camera on a 35mm sensor size with a 75mm prime; they therefore might then opt for a 150mm prime on the Alexa 265 to match a similar frame size at the same camera distance. Instead, Laxton *maintains* the approximate camera distance and focal length, creating a wider frame size. The result is that the Alexa 265's field of view is larger than that of the Alexa 35, but the depth of field remains the same. He is capturing the nuances and body language of an actor's performance in a wider shot, with greater foreground/background separation.

The Alexa 265 workflow is identical to that of the Alexa 35 in many respects, with the same Codex Compact Drives capturing Arriraw in an MXF wrapper. To manage file size, the 265 also offers the option of Codex High Density Encoding (HDE) during download to reduce file sizes by about 40 percent. This streamlines on-set workflow, saving time, storage space and bandwidth, particularly for 6.5K Open Gate workflows.

For the 265, Arri designed a new behind-the-lens, slide-in filter-cartridge system instead of an internal, mechanical ND system to keep camera size down. They also created a set of FSND filters ranging from zero to ND2.7, in one-stop increments, which slide into the camera body and pass through metadata via a small chip on the cartridge frame. Filter type appears on the camera's display. Leveraging the flexibility of this new system, Tiffen has already created compatible diffusion filters in various "flavors," and since it's also possible to send a small electrical current from the camera back to the cartridge via that little chip, the idea of a variable ND also comes to mind.





Right-side and right-front views of the camera.

ASC members James Whitaker (pictured here) and Polly Morgan (below) shooting with the 265.

Arri will only confirm that they are exploring that option.

The camera's compact size — it's slightly larger than the Alexa 35 — is already paying dividends for Morgan. In South Africa, access to remote heads is limited, but Ronin and Movi systems are common. She notes that the versatility and light weight of the 265 is essential to working efficiently with those systems, adding, "With our tight schedule, we also need to move quickly between different camera builds and setups. The 265 has been used handheld, and also with a drone, cablecam, Technocrane, underwater housing, jib arm, G link handheld Ronin, modular crane and a dolly."

The 265's form factor is also lauded by ASC member James Whitaker, who's been shooting with the camera on his latest project, the HBO limited series *DTF St. Louis*. "Arri has seemingly accomplished the impossible with the 265, because it seems [improbable] that you could fit the giant sensor, slide filters and all of the camera's functionality into such a small package," he says. "For this show, I needed a large sensor, but in a smaller-form camera for the variety of shooting modes we would be using.

"I've been wanting to shoot in the 65mm format on a narrative project for a long time," he adds. "Because the 265's large sensor allows the use of longer focal lengths [to produce] a similar field of view, you have a larger focal range to choose from when setting your aperture [for the show, as opposed to being required to use slower, wider lenses in smaller formats]. But the thing I love most about the large sensor is all of the imperfections on the edges of the frame. You can tune those [in] with your lens manufacturer, but optical imperfections tend to lie on the edges of the glass, and the 65 format reaches for them."

Whitaker concludes, "The arrival of the 265 was perfect timing for me, and I appreciate Arri trusting me to be among the first to use it. On this production we've shot with three Arri 265s, three Alexa 65s, multiple Mini LFs and some Alexa 35s — not bad for a 'single-camera' shoot!"

For more information, visit arrirental.com.

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Tari Segal Welcomed as New ASC Member
The cinematographer's recent credits include the series *Long Bright River* and *Interior Chinatown* and the forthcoming feature *Bookends*.

Dreaming in Black-and-White
An informal survey of modern monochrome motion pictures that took advantage of the format's unique abstract attributes.

Goldschmidt Welcomed into ASC Membership
The Emmy- and ASC Award-nominated cinematographer's recent credits include the series *House of the Dragon* and *The Last of Us* and the forthcoming feature *Out There*.

The Japanese Method for *Ran*
Legendary director Akira Kurosawa prefers to use multiple cinematographers on all of his films, dating back to 1954's *The Seven Samurai*.

Sundance Standouts 2025
A look at some outstanding features that screened at the Sundance Film Festival in Park City, recommended for their distinctive camerawork.

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DZOFilm | X-tract Probe Zoom Lens

DZOFilm has introduced the X-tract 18-28mm T8 90-degree Probe zoom lens.

A 360-degree rotating ring enables precise horizontal adjustments, while the square front element with a PET silver-coated reflective layer maximizes light transmission. Designed for full-frame sensors and compatible with S35 formats, the lens provides an equivalent 22-35mm T8 focal range in Arri Alexa 35 Open Gate mode and has a 6mm minimum-focus distance.

For more information, visit dzofilm.com.

Aputure | Storm XT52

Aputure has announced the Storm XT52.

The fixture's BLAIR light engine outputs tunable white light from 2,500-10,000K CCT and features Full +/- Green tint control. In Limited HSIC+ and xy modes, saturated colors covering more than 70 percent of the Rec.2020 color space can be achieved. The use of an Indigo emitter to output near UV activates the natural fluorescence in people and objects.

The Storm XT52 weighs 61 pounds and can be used with a standard crank stand. The control box is 22 pounds and includes a mounting clamp.

For more information, visit aputure.com.

Venus Optics | Laowa Probe Zoom Macro

Venus Optics has unveiled the Laowa Probe Zoom Macro Lens.

The solution features two focal lengths — 15-24mm (T8) and 15-35mm (T12) — and four interchangeable front modules: Direct View, Periscope, 35° View and 90° View. The 90° View module is designed with a 360-degree rotation mechanism. The lens features a waterproof design and offers a 110.5-degree angle of view and a 2.3x zoom range.

For more information, visit venuslens.net.

Creamsource | Slyyd

Creamsource has launched Slyyd, a free iOS app for managing and controlling DMX-based lighting systems.

Engineered for the demanding environments of film production, live broadcast and media production, the app features user-friendly features such as drag-and-drop patching, smart auto-configuration and an "undo" button.

For more information, visit creamsource.com.

Sony | Ocellus

Sony Electronics has announced Ocellus, a solution designed to simplify augmented-reality and virtual-production applications in broadcast and cinema by providing marker-free camera tracking through multiple sensors.

Ocellus comprises a sensor unit, a processing box and three lens encoders. The system is camera agnostic and can be used with Sony Cinema Line cameras, system cameras and non-Sony cameras. Using five image sensors and Sony's Visual Simultaneous Localization and Mapping technology, the system creates a reference map, enabling stable, marker-free tracking indoors and outdoors.

For more information, visit pro.sony.

Submit news, updates and releases to newproducts@ascmag.com

Viltrox | 2 Solutions

Viltrox has announced two full-frame lenses, the AF 135mm *f*/1.8 Lab Z and the AF 50mm *f*/2.0 Air FE/Z.

Available for Nikon Z-mount, the 135mm features Viltrox's Quad HyperVCM motor technology, which ensures rapid, precise autofocus, and a dual floating-focus system. Ergonomic lens-control buttons and customizable LCD startup animations enhance user experience.

Available for Sony E-mount, the 50mm lens builds on the Air series' lightweight design and offers exceptional sharpness edge to edge. An HD nano multilayer coating further enhances clarity. The lens weighs 7.5 ounces and fits into a pocket.

For more information, visit viltrox.com.

Nanlite | PavoTube II 6XR

Nanlite has released the PavoTube II 6XR, an eight-pixel full-color tube light with CRMX control.

The 9.8"-long solution features eight individually controllable pixels; an internal, rechargeable battery as well as PD 3.0 power input; and Bluetooth, DMX/RDM and LumenRadio CRMX control. It incorporates Nanlite's RGBWW color-mixing technology, providing a color-temperature range of 2,700-12,000K and ±150 green/magenta adjustment, and delivers 562 lux at 2'.

For more information, visit nanliteus.com.

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Kelvin | 3 Solutions

Kelvin has introduced the Play Hero pocket light, the Versa Fresnel system for optical attachments, and the Speed Box soft-box series.

The Play Hero delivers 1,200+ lux at 3'. Its Cantastoria RGBACL light engine ensures a CCT range of 1,700-20,000K. Two operating modes enable users to choose either maximum brightness or maximum operating time.

The Versa with Fresnel 10 is a patent-pending system for optical attachments that features a collapsible design and offers Bowens Mount compatibility.

The Speed Box 4x3 (35.4"x47.2"), Speed Box 3x2 (23.6"x35.4"), Speed Octa 3 (35.4") and Speed Octa 4 (43.4") feature durable aluminum parts and reflective materials.

For more information, visit kelvinlight.com.

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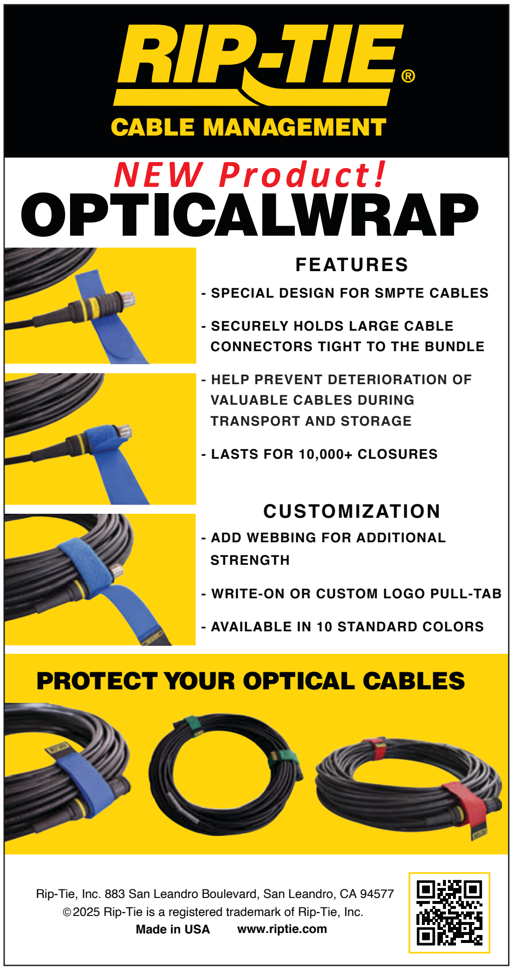
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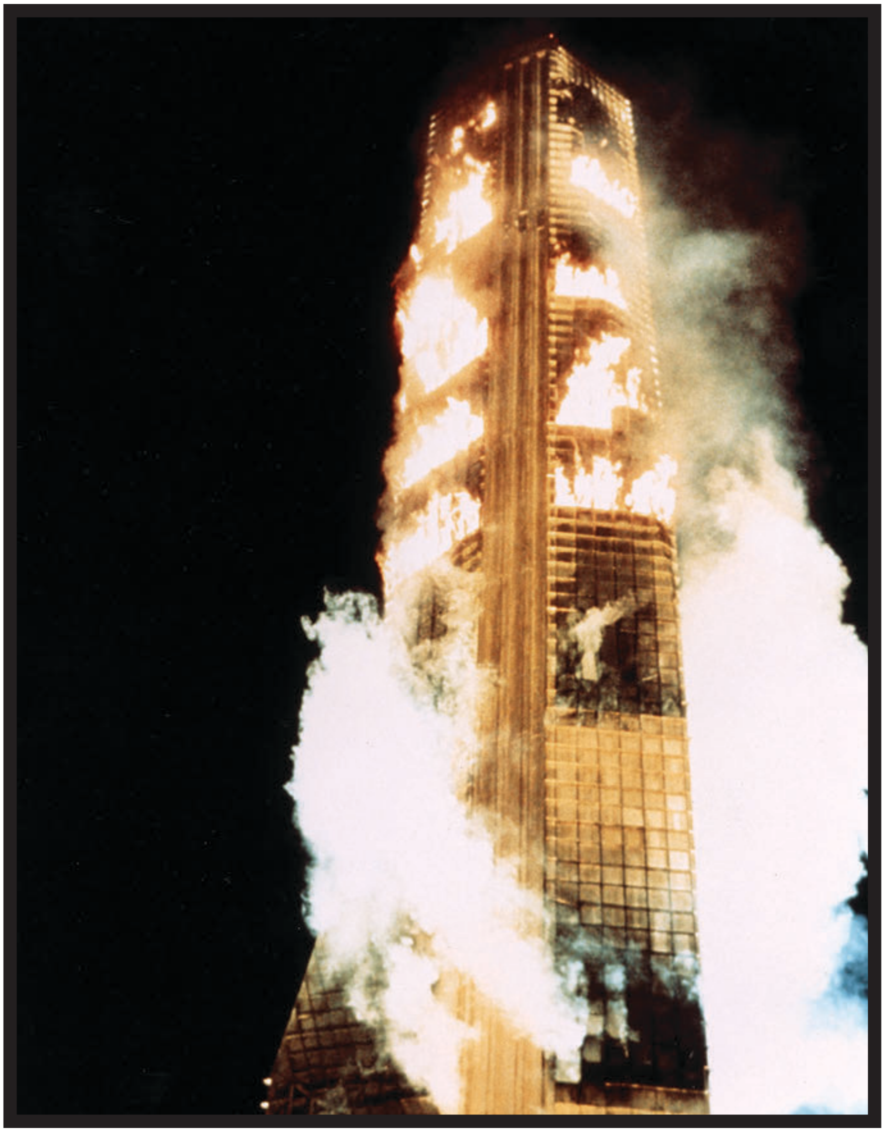
Wrap Shot
The Towering Inferno



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In 1974, Twentieth Century-Fox and Warner Bros. Pictures joined producer Irwin Allen; director John Guillermin; and directors of photography Fred J. Koenekamp, ASC and Joseph Biroc, ASC to mount one of cinema's most spectacular high-rise disasters: *The Towering Inferno* (*AC* Feb. '76). Koenekamp focused on dramatic scenes and Biroc focused on action, while L.B. Abbott, ASC oversaw special photographic effects, with mechanical effects by A.D. Flowers and Logan Frazee also helping to create the illusion of a 138-story glass-and-steel building erupting in flames above San Francisco.

The Glass Tower itself, based on a production design by William Creber, resembled an asymmetrical shard of gold-tinted glass that overshadowed the adjacent fictional Peerless Building. The filmmakers shot ground-level scenes of the Tower at San Francisco's Plaza Hotel. Wide shots and exteriors featured two ⅟₂₄-scale miniature skyscrapers constructed at Sersen Lake on the Fox studio backlot.

The Tower model was a 70'-tall, three-sided metal structure. Acetylene gas emitters, spark-plug igniters and air-jet agitators produced orange-colored flames and black smoke that Abbott filmed at 72 frames per second. To accentuate the Tower's height in up-angled shots, Abbott filmed into a mirror at the base of the miniature. Closer shots featured a larger-scale miniature section of 10 6-inch-square windows, and a full-scale, five-story Tower facade built at 20th Century-Fox Ranch (now part of Malibu Creek State Park). Interiors included a soundstage set of the Glass Tower's Promenade Deck with a 340' cyclorama of Bay Area skyline. City exteriors featured optical composites of miniatures matted into San Francisco plates filmed for day, night and magic-hour perspectives.

The Towering Inferno was nominated for eight Academy Awards, earning Oscars for Koenekamp and Biroc. "Working with Bill Abbott is an experience I'm grateful to have had," Koenekamp told *AC*. "He's a genius in his field."

— *Joe Fordham*

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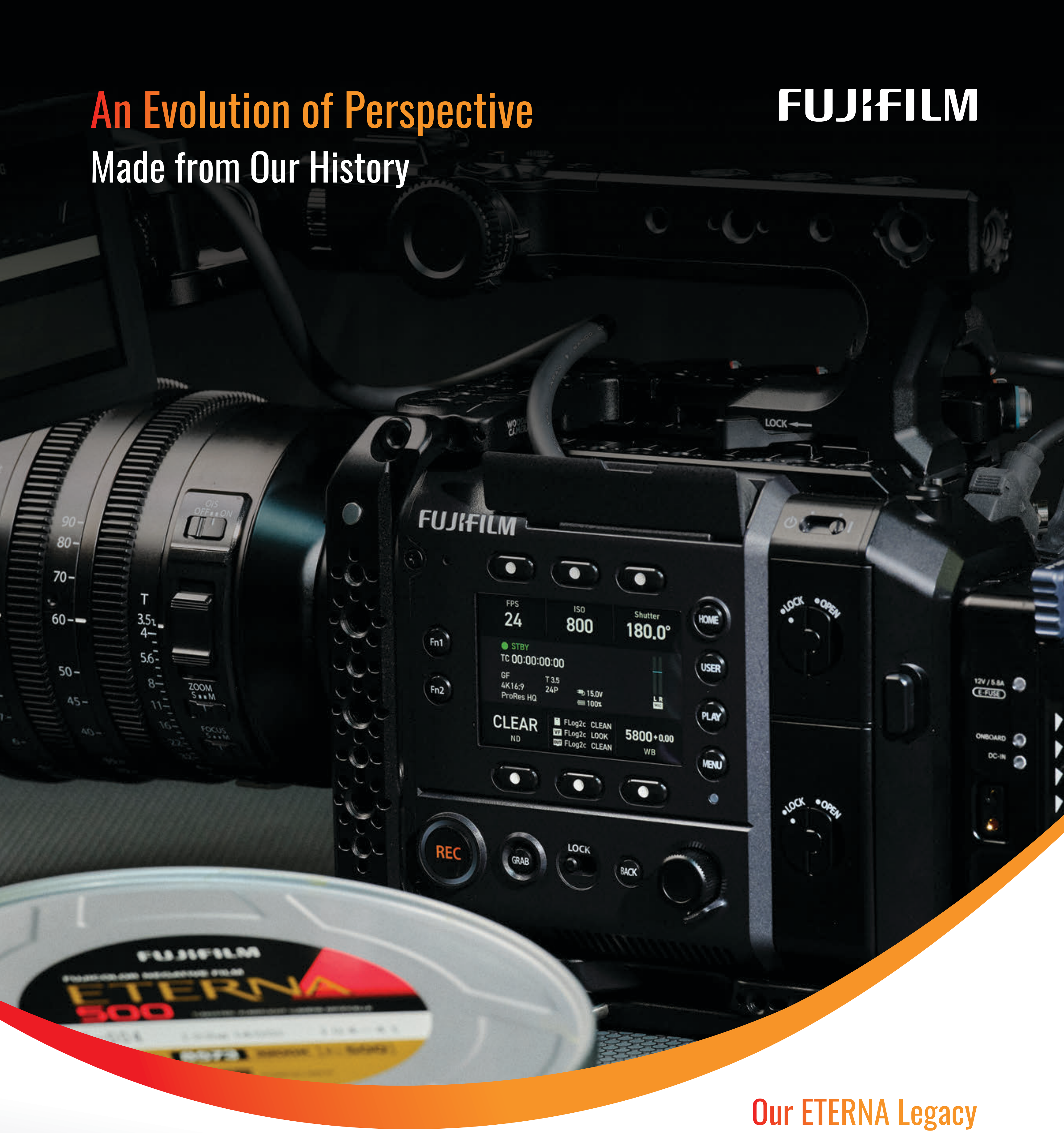

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